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BRUCE'S SCHOOL SHOP ANNUAL

This issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION presents to its readers the thirteenth edition of Bruce's School Shop Annual.

As heretofore, the content for this issue has been collected with special care to include articles which would be helpful to all those interested in industrial arts and vocational education.

C. K. Lush's article on the *Multiple Shop Concept*, and Fred M. Smith's *Condensed Check List for Shop Planning* will be especially helpful to those confronted at present with the arrangement of new school shops.

The articles by George J. Mann, Nelson J. Murbach, and Charles S. Allen present a good picture of the way in which others have attempted to solve the problems which they encountered.

Growing out of the work done in the past in day-time school shops, have developed such efforts as the evening school and the instructional work now grouped under the heading "diversified occupations." These are adequately described by H. P. Harshbarger and by Alan L. Beamer.

Harold M. Gray, Herman A. Pohlman, and Robert A. Brenholtz present methods which they have tried out in improving the offerings of their respective school shops.

Those interested in course outline materials in prevocational English, woodwork, printing, and arc welding, will do well to consult the articles written by Della Gervin Freeman, R. C. McNabb, M. R. Stewart, and H. C. Hively.

Very helpful and usable material may be found under "Testing and Tests," and the heading, "Miscellaneous." Those deserving special mention are E. N. Whittington's *Standardized Test for the Industrial-Arts General Shop, Publishing and Printing*, by R. Randolph Karch, and *The Public Schools and Juvenile Delinquency*, by R. M. Kindred.

Besides the foregoing, there are the ever-helpful equipment and supply lists which have in the past been found exceedingly helpful by teachers of woodworking, metalwork, automotives, printing, drafting, and electricity.

Articles Indexed — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."
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The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Phillippine Education Co., Manila, P. I.

J-18 SURFACER

Now Equipped With Variable Feed Drive

Here's news . . . news that will interest all school shop men! Yates-American now furnishes the J-18 Surfacer with an easy operating variable drive which provides an unbroken range of feeds from 15 to 45 feet per minute. This means that you can now vary the rate of feed on the J-18 to suit the stock being handled. Whether you are working with hard or soft wood, the speed you need to get a high quality finish is instantly available by simply turning a convenient hand crank . . . without stopping the machine. The control is calibrated to show rates of feed.

All moving parts are fully enclosed for the protection of the operator. The lines of the drive unit are designed to conform with the general contour of the machine—and thus add much to the pleasing appearance of the entire unit. Like all Yates-American features this drive is built in as an integral part of the machine.

In all other respects the new J-18 is essentially the same as previous models and retains all the features which have made it so widely preferred. It is sturdily built. The base, two side frames and top girt are cast in one piece. The bed is also a one-piece casting, heavily ribbed and girted. The removable platen under the head is of hardened steel. Because it swings concentric with the cutterhead, the solid chipbreaker cannot strike the knives. The three-knife round safety-type cutterhead is mounted in special high speed ball bearings. All moving parts are fully enclosed . . . ball and roller bearing equipment throughout. Let us send you complete information . . . there is no obligation. Write now to the

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

SHORT TALKS ON WOOD

YELLOW BIRCH *(Betula lutea)*

Of the 15 to 20 species of birch found in the United States, yellow birch is by far the most important and abundant. The wood is heavy, strong, hard and close-grained. Possesses a variety of distinctive and pleasing grain figures, best known of which is "curly" birch. Has fine finishing characteristics and good wood-working qualities.

Ranks high in favor among American cabinet woods and is used widely for furniture, flooring and interior finish. Also utilized in the manufacture of woodenware, spools and bobbins, boxes and dowels. A good firewood.

Distributed from Minnesota to Newfoundland, south to Pennsylvania and along the mountains of North Carolina and Tennessee. Inhabits rich uplands, swamps and borders of streams. Abundantly available. Easily propagated although very slow growing.

A rather large tree—often attaining a height of 60-70 feet and a trunk diameter of 2-3 feet. The trunk usually divides itself into two or three limbs some distance from the ground. Broad round-topped head in open, but small and irregular in the woods.

The bark on young trees is silvery or yellow with thin papery scales. On old trees the bark is made up of large, thin, dull plates, grayish in color. The leaves are simple, alternate, oval, 3 to 5 inches long, doubly toothed, upper side dull and dark green in color. Fruit is an erect, cone-like spike containing small, flat, brown, winged seeds.

This is the fifteenth of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

School Shop Planning

The Multiple Shop Concept

C. K. Lush

Supervisor of Industrial Arts, Minneapolis, Minnesota

Making school-shop space more productive by continued use.

Industrial-arts education covers a range of some seventy-odd courses in contrast to the one or two of some thirty years ago. Industrial arts has grown to become a basic part of the foundation of general education.

The constant diversification and enrichment of our industrial-arts courses have brought about a tremendous change in the physical layout of the school shop. Building space has been increased and improved, and the equipment has been made to include a much greater variety of machines, tools, and work stations.

A modern program of industrial arts, in the junior high school, consists of broad general courses (usually required), offering experience in four or five diversified major fields.

In the senior high school enriched exploratory courses are continued the first year or two with opportunities for specialization during the latter years. This subject concentration may or may not be vocational training, depending upon physical and instructional accommodations and the use that is made thereof.

For a successful program in the senior high school the previous school instruction consists of such information and tool experiences as will make for pupil self-direction. Such training is most efficiently and effectively given in groups homogeneous as to age and course content. It has undoubtedly been proven empirically that an entire class receiving the same instruction at the same time will have a training that is more intensive and extensive than a class taught several unrelated first courses simultaneously.

The purpose of this paper is to illustrate a technique in shop planning involving the assembly of equipment by which entire classes may be offered the elementary general courses on the unit plan and advanced courses on the general plan with a maximum of instructional efficiency at a minimum cost.

Classification of Laboratories

The vast number of courses offered under the title of industrial arts and the subsequent variety of shops in which this instruction is given make it necessary to classify these laboratories. A shop in which more than one type of activity may be taught is referred to as a *general shop*. It probably began when a woodworking teacher brought a pair of tinsnips, a blowtorch, and soldering iron into the wood shop. The term *general shop* is very broad. There are many types and varied conflicting opinions as to their practicability. A classification of existing shops may be made as follows:

The *specific unit shop* is one equipped to teach one course such as a machine-shop, a welding, or a printing course. These are most common in the large senior high schools, where enrollment may accommodate a full day's program for one teacher. Vocational schools are built primarily of this type of shop.

The *general unit shop* refers to the room in which many courses may be taught with the same media. The general metal shop of the junior high school is a good example of this. Here pupils work in metal alone, but cover such fields as sheet metal, art metal, forging, foundry, welding, machine shop, bench metal, etc.

The *laboratory of industries* is one wherein one teacher offers as many courses as his training, the equipment, the needs of pupils, and the enrollment, permit. This is usually thought of as the kind of shop which contains little duplication of equipment units, making it necessary for the teacher to divide each class into small groups, or course sections. This type of shop is the solution for a broad industrial program in the small one-teacher department.

The multiple-activity shops are of two types. First, there is the shop with major and minor divisions, a room with enough woodworking benches for an entire class supplemented by very limited provisions for such other courses as metalworking, electricity, and auto mechanics. Second, the combination shop where the equipment is such that it may all be used by an entire class for several unit courses.

Factors Influencing Shop Planning

The type of shop selected for a given situation depends upon such factors as school enrollment, enrollment expectancy in industrial arts, type of school, pupil and community needs, the objectives of the courses, the availability of trained teachers, and the material resources of the board of education. The gradual diversification of industrial arts has indeed complicated the problem of industrial-arts planning.

Two present-day conditions in the public schools have necessitated a more intensive study of shop planning. The increased secondary-school enrollment has made it imperative that all building space in existing industrial departments be justified. Additional space for other expanding departments is usually in great demand. To increase the efficiency of a building, school administrators are apt to look upon shop rooms which are used but a few hours per day with a questioning eye. They may see a mechanical-drawing room idle three hours a day and, being crowded in other parts of the building, attempt to exclude the drawing entirely. Secondly, a board of education faced with the problem of constructing a new building with very limited funds, forces the person responsible for the planning of industrial arts to estimate very accurately the amount of building space needed. The size of the department must fit the size of the building, where such a situation exists. We cannot order a full complement of shops and then have the building efficiency lowered tremendously because several of the shops are used but a few hours per day.

The trend is definitely for more industrial arts,[1] and the space now available in existing departments must be studied scientifically from the standpoint of building and teaching efficiency. Sufficient space must be obtained for industrial-arts education and the increased demand for non-industrial space must be weighed against the additional space seemingly necessary for the industrial enrollment increase where it exists.

Mechanical Drawing and Arts

The combination shop may be the solution to some of these problems, especially for the two- and three-teacher industrial-arts departments. In the one- to

[1] *School Life*, November, 1937, Vol. 23, No. 3, p. 86.

two-teacher departments, the mechanical-drawing room may be used but one or two hours per day. In the same school, art may be taught but three or four hours per day. These two rooms may be combined very easily. The 30-in. art table with the 17-in. chair is a common pupil work station for art instruction. These stations may be used for mechanical drawing. The table might probably be cut down 1 to 2 in. without harm for art-work. The chair is an improvement for mechanical drawing. Stools now used in our drawing classes are very uncomfortable for students when not drawing. The trend in this course is for more *chair* work and less *stool* work! More and more oral instruction is included in mechanical-drawing courses, and more reading of drawings. This results in more *chair work*. Home rooms are included in our departments — extracurricular clubs are increasing, for which chairs again are better than stools. The idea that a boy *must* sit on a stool to draw is not proved by experience. On large plates, developments, mechanical perspectives, furniture drawings, etc., a large working area is essential and stools may be more advantageous. The small schools may include one or two high tables for the few advanced pupils to use.

A workable combination-art-and-drawing table is shown in Figure 1. When the top is tilted, a protruding board catch appears along the front edge of the table.

Printing and Mechanical Drawing

Printing and mechanical drawing may be combined feasibly. A drawing table *36* inches in height, shown in Figures 2 and 3, with a tilting top and type-case catch (see along the front edge when tilted) adapts the table for the flat drawing space or tilted type space for type cases. The removable type-case rack, shown in Figure 3, also adapts the conventional drawing tables for teaching printing.

In this room the drawing boards and pupil's storage space are provided in the tables. The type cases are stored in storage cabinets distributed about the room. Presses and other printing equipment as well as necessary blueprinting duplicators, are located at the back of the room.

Beginning classes in drawing and printing may be taught as unit classes in this shop. Advanced classes may be mixed — part of a class taking advanced drawing and the rest advanced printing.

Woodworking and Metalworking

These two shops may also be combined by the use of combination work stations shown in Figure 4. Part of the benches in Figure 4, are two-thirds double workbenches as shown at *A*. For elementary woodworking, a smaller benchwork space is needed by each pupil than for advanced work. These benches accommodate two elementary pupils, the rest of the class work on the single combination benches shown at *B*. This arrangement permits a full class to take elementary woodworking.

The combination wood-metal benches are standard-size wood benches with a metal vise on one side and a rabbeted angle iron along the same edge. See *B*, Figure 4. Two metalworking pupils work at each bench. A class size of twenty-four in elementary general metalworking is accommodated by the twelve single stations. An individual work station for each boy is definitely an advantage for efficient instruction in large classes.

Students in the advanced classes of metalworking and woodworking have ample working bench space. The woodworking pupils may be assigned to an entire two-thirds double wood bench each, while ample space is available for the metalworking pupils.

The Diversified One-Teacher Shop

Figure 4 is a drawing of a proposed one-teacher diversified shop offering the advantages of unit shop instruction for the elementary classes and general shop instruction for the advanced pupils. Electricity, auto mechanics, and other activities are shown provided. Elementary electricity may be taught as a unit course here also, each bench being wired with a hundred ten volts and six-volt outlets. A definite advantage of this laboratory over the major-minor multiple shop is that congestion is greatly eliminated. Confusion is unavoidable when limited equipment for each subject is grouped in various parts of the room. Pupils in mixed classes, as well as

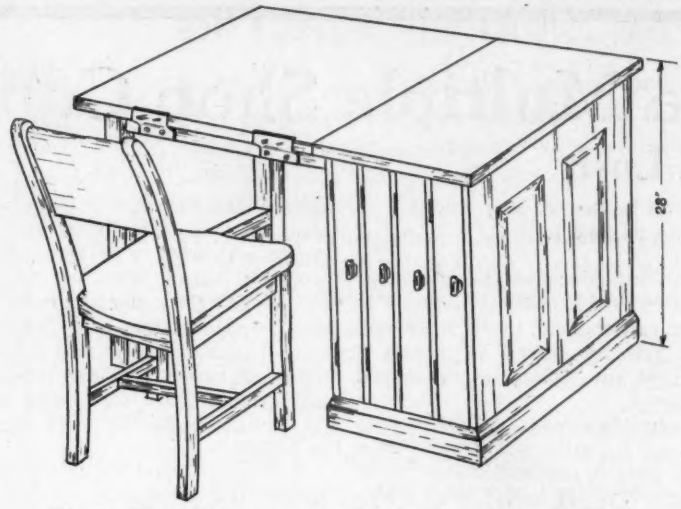

Fig. 1. Combination art-mechanical drawing table with chair

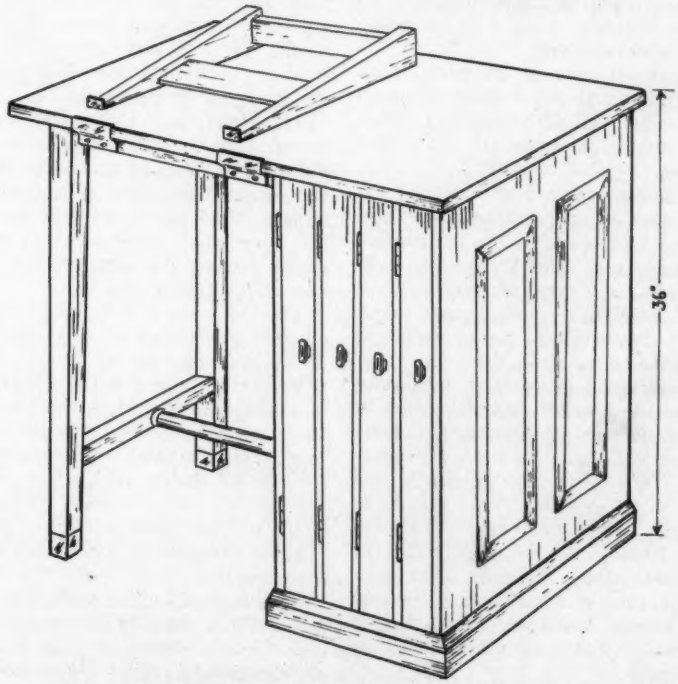

Fig. 2. Combination mechanical drawing and printing table with tilting top or type case rack

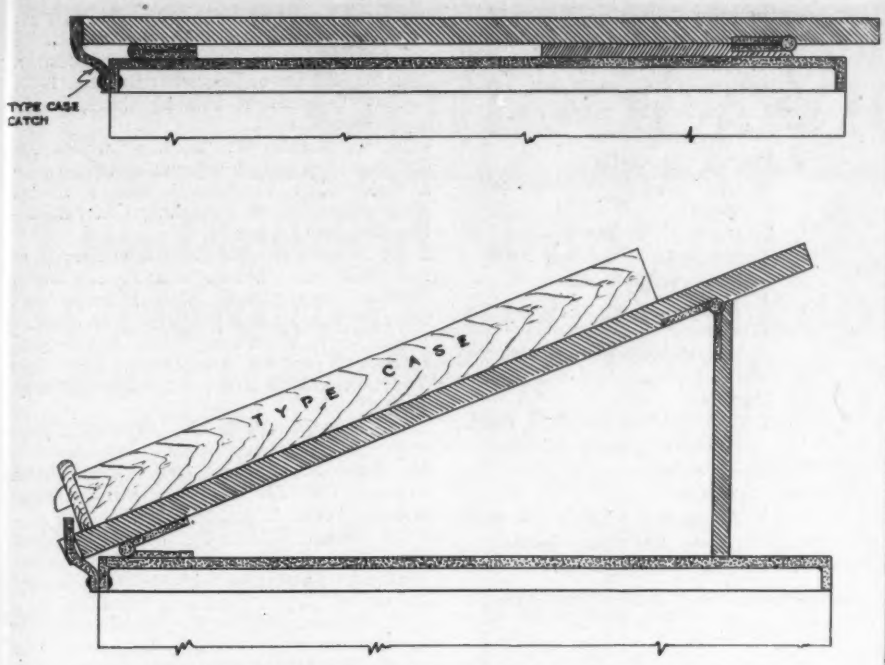

Fig. 3. Details of tilting top: The type-case-catch is flush with the horizontal surface, but protrudes to hold type case when the top is tilted

unit classes, would be spread out over the entire room in this proposed shop thus eliminating the problems due to pupil congestion.

Summary

In summary, the combination shop is a type of general shop. The combination shop seems to fit a department with from one and a half to three teachers better than other types. The combination shop is recommended for industrial departments in middle-size schools.

There are many industrial subjects taught today, each requiring special equipment, for which the enrollment may justify less than a full day of classes. Many of these subjects may be offered in varied combinations in a multiple shop. The following subject combinations are possible: drawing and printing; drawing and bookkeeping; drawing and art; wood and metal; wood, metal, and electricity; metal and auto mechanics; electricity and metal; and sheet metal and aviation.

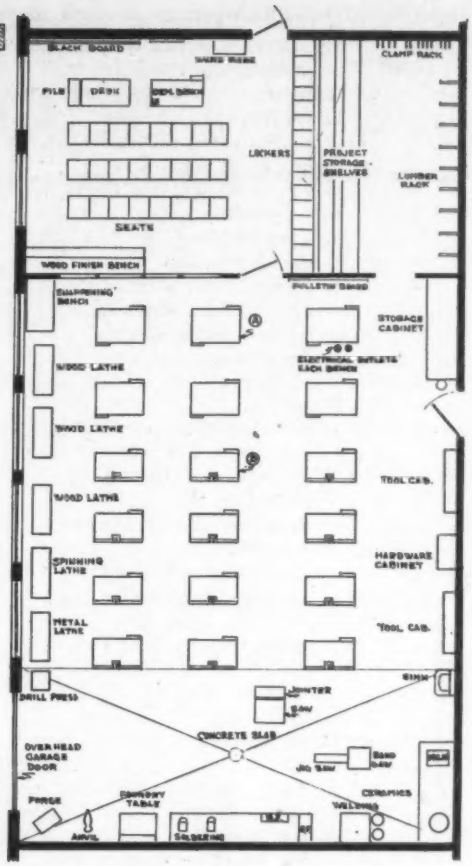

Fig. 4. The diversified combination one-teacher shop

Some change is necessary in the design of standard equipment for unit shops for effective combinations.

A Condensed Check List for Shop Planning

Fred M. Smith

Junior Senior High Schools, Iowa Falls, Iowa

This list is the result of efforts to set up a check list, which, while more or less ideal, would act as an aid in evaluating established industrial-arts shops and to suggest bases for the organization of projected departments.

I. Location
  A. Place
    1. Wing of building
    2. Separate building (in some states)
  B. Floor level
    1. First floor
    2. First floor under auditorium

II. Entrances
  A. Direction of swing
    1. Out to direct traffic to nearest exit
  B. Construction
    1. Glass

III. Floors
  A. For shop use
    1. Wood "blox" on end or edge
    2. Concrete or dirt for foundry
  B. For drawing division or office
    1. Cork tile
    2. Mastic tile
    3. Linoleum
  C. Floor space per pupil
    1. Drawing, 30 square feet, up
    2. Average shopwork, 50 square feet, up
  D. Width to length ratios of rooms
    1. One to 1
    2. One to 2
  E. Project storage
    1. Individual lockers in shop
    2. Separate room

IV. Natural lighting
  A. Direction of natural light
    1. North with light coming from the left
    2. East or west
  B. Ratio of window space to floor space

Valuable alike for those who are projecting new shops or evaluating the old.

1. One to 5 to 1 to 6
2. One to 6 probably best for architectural reasons

C. Windows
1. Sill height
a) Above 40 inches
2. Extent of window
a) To as near the ceiling as possible
3. Type of glaze
a) Clear glass
4. Light-control method
a) Venetian blinds
b) Adjustable drapes
5. Type sash
a) Steel

D. Ceiling heights
1. For regular shop
a) Twelve to 15 feet
2. For foundry, carpentry, plumbing, etc.
a) More than 15 feet

E. Wall colors
1. Above the eye level
a) Some light color; e.g., ivory, light tan
2. Below the eye level
a) Darker shades or the same color

V. Artificial lighting
A. Light requirements in foot-candles
1. Thirty to 50 foot-candles
B. Wattage allowance per square foot of floor space
1. Six watts per square foot (approximately)
C. Reflector types
1. Indirect
2. Semidirect with supplementary lighting when necessary

VI. Auxiliary Features
A. Tool systems
1. Toolroom
2. Tool panel
3. Combination system
B. Master switch
1. Control in office
2. Control in toolroom
C. Alarm bell and buzzer
1. Control in toolroom
D. Electric clock
E. Telephone
1. In office or near instructor's desk
F. First-aid kits
1. Near washbasins
2. Near exits
G. Fire extinguishers
1. Permanently located; near exits and in far ends of room
H. Washbasins or lavatories
1. One for each 12 to 15 students
I. Drinking fountains
1. One for each 12 to 15 students
J. Benches
1. Steel body with lockers in the bodies
K. Showcase or exhibit case
1. In principal corridor

VII. Heating and ventilating
A. Control
1. Automatic to give temperature of 65 to 68 deg.
2. Constructed to prevent "meddling"
B. Placing of radiators
1. Up on walls to conserve space
C. Changes of air per hour
1. Six to ten times per hour
D. Type of ventilation
1. Natural
2. Supplementary mechanical ventilation when necessary
E. Method of caring for objectionable fumes, etc.
1. Exhaust blowers, fans, hoods, or vents to carry off fumes

VIII. Absorbing noise
A. Methods
1. Acoustical plaster on walls above five feet from floor and on ceiling
2. Use of acoustical board such as celotex, cane board, straw board

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THOMAS JEFFERSON'S TEN RULES

1. Never put off till tomorrow what you can do today.

2. Never trouble another for what you can do yourself.

3. Never spend your money before you have it.

4. Never buy what you do not want because it is cheap; it will be dear to you.

5. Pride costs us more than hunger, thirst, and cold.

6. Never repent of having eaten too little.

7. Nothing is troublesome that we do willingly.

8. How much pain the evils that never happened have cost us.

9. Take things always by their smooth handle.

10. When angry, count ten before you speak; if very angry, a hundred.

—Taken from *The Ranken News*, Dec., 1939.

Aim at perfection in everything, though in most things it is unattainable; however, they who aim at it, and persevere, will come much nearer to it, than those whose laziness and despondency make them give it up as unattainable. — *Chesterfield.*

School Shops

The General Shop at Haldane Central School

George J. Mann

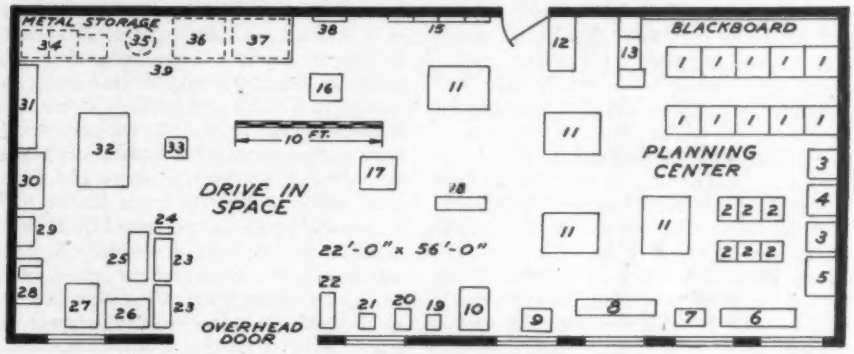
Haldane Central School,
Cold Spring on the Hudson, New York

Layout and method of procedure used in a given situation.

The industrial-arts department of the Haldane Central School was begun concurrently with the completion of the new building in September, 1936. The school has an enrollment of approximately 700 students, quite evenly divided between elementary and junior-senior high school. From this total of 350 junior-senior high-school students, the industrial-arts department is serving approximately 110 boys. A general shop course is taught in the 7th, 8th, and 9th grades, these classes meeting 2, 3, and 4 periods of 55 minutes per week, respectively. Cabinetmaking and a course in advanced general metal is provided on the year rotation method. This provides for a major sequence or 3 units of industrial-arts credit toward graduation from the high school.

The location of equipment, and general floor plan setup, were changed frequently over the past 3½ years until the floor plan shown herewith, was finally reached. It is believed that this particular layout provides for ease of accessibility, safety, economy of time, designation of units, student and teacher efficiency in the best possible way for this particular school. It is probable that this setup is not feasible for many schools because of certain architectural, subject, or economic differences; but certain units or sections of it might well be considered with the necessary modifications by any teacher, who is faced with layout of a new shop or the changing of the present one.

Equipment has been purchased over a two-year period and includes the items shown on the layout of the floor plan. The shop is roughly divided into three sections. Starting at the *planning center* the reader



General-Shop Floor Plan

1. *Drafting benches*
2. *Seats*
3. *Bookcases*
4. *Drawing-board stand*
5. *Tool rack for lathe No. 6*
6. *Metal and wood lathe*
7. *Grinder*
8. *Wood lathe*
9. *Sandpaper, emery cloth, etc.*
10. *Bandsaw*
11. *Wood bencher*
12. *Instructor's desk*
13. *Lockers*
14. *Filing cabinet*
15. *Textbook racks*
16. *Disk and belt sander*
17. *Circular saw*
18. *Jointer*
19. *Spot welder*
20. *Electric shears*
21. *Drill press*
22. *Jigsaw*
23. *Tool cabinets*
24. *Nail and screw cabinet*
25. *Finishing table*
26. *Finishing cabinet*
27. *Foundry bench*
28. *Furnace and bench*
29. *Bar folder*
30. *Supply cabinet*
31. *Sink*
32. *Metal bench*
33. *Anvil*
    Note: Nos. 34, 35, 36 and 37 are beneath lumber rack
34. *Scrap-metal bins*
35. *Waste barrel*
36. *Clamp rack*
37. *Short-length lumber rack*
38. *Short-length band-iron rack*
39. *Lumber rack*

Fig. 1. The planning center in the background

Fig. 2. Woodworking section

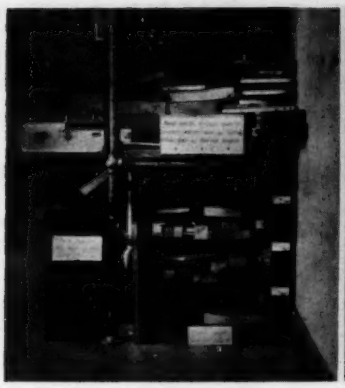


Fig. 3. Short length lumber rack

Fig. 4. Clamp rack beneath lumber rack

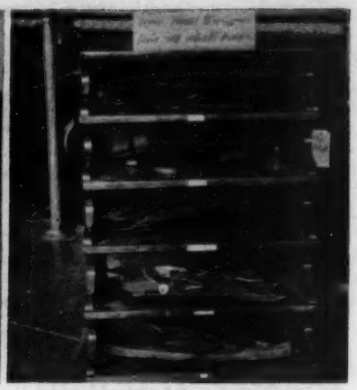


Fig. 5. Scrap metal bins

will perceive the library, recitation, and mechanical-drawing units. See layout and Figure 1. The latter illustrates the motion-picture setup with the screen placed on the blackboard. Movies are shown once a week. The next major section is the woodworking division. Most machinery has been located along the wall, insofar as practicable. This provides for maximum light, safety, and ease of accessibility. The circular saw and jointer, however, were placed approximately in the center of the room to provide for maximum efficiency. The band saw is set out from the wall far enough to cut long pieces. The next major section is occupied by the metal, auto-mechanics, and electrical units. The electrical board located on the side of the lumber rack, metal bench, drive-in space, foundry, and furnace complete the units.

Sheet metals of all kinds, band iron, and lumber are stored on or under the lumber rack. The size of this lumber rack is much too large for a shop of this type; however, with a little ingenuity much of the waste space has been used to good advantage. Floors were built into the rack to hold projects and other types of materials; wooden boards were put on one side to be used for an electrical board, etc. Five gutters were placed under the lumber rack to store band iron, as shown in Figure 3. A short-length lumber rack was made with the width and height of the bottom section of the lumber rack as limits. Materials used were two by fours and ¼-in. plywood. Pieces of wood in lengths of 1 to 6 in. and 6 to 12 in. are kept on the rear decks, while pieces in lengths of 12 to 24 in., 24 to 36 in., and 36 to 48 in. are kept in the three bins shown in Figure 3. As shown in the same illustration, two ¾-in. plywood pieces are hinged to the lumber rack to provide supports for sawing long pieces of lumber. When not in use they are swung back out of the way.

The clamp rack, shown in Figure 4, was designed and built so that it would fit beneath the lumber rack. It is constructed on an angle so that the rear steel bar clamps can be reached easily. Two by fours were used in its construction. Dadoes support the steel clamps.

Many useful articles for the shops were made from the top sections of old school desks. Scrap-metal bins were made by turning the desks upside down, nailing them together and fastening them to a suitable base. See Figures 5 and 6. These bins are placed under the lumber rack. They are suitable for storage of small pieces of metal such as brass, copper, pewter, sheet iron, aluminum, and the like. Long sheets of metal are stored behind the bins under the lumber rack. The availability of bins for storing usable pieces of various woods, metals, resins, and other materials makes for economy in the school shop. The sharpening stone rack is shown in Figure 6. It is also made from an old school desk. Small desks were then used to provide bins for various grades of sandpaper, steel wool, and emery cloth. Four desks were fastened to the wall to provide storage space for schoolbooks when boys are in the class. to the wall to provide storage space for putting books on benches or machines. At each end of the metal bench a desk was securely fastened to hold pipes, bending jigs, and small stakes.

Each wood bench has been provided with a heavy maple block to be used by students for boring, chiseling, sawing, and the like. See Figure 7. This convenience assists in keeping the wood bench free from cuts and nicks. The chain is long enough to enable the student to put the block in either vise.

All machinery, cabinet desks, seats, etc., are painted a medium dark green giving the shop a trim appearance. All switches and safety devices are painted a bright red. Each machine, when necessary has a small box located over or near the turn-on switch with a pair of goggles in it. Usually the student has to take the safety glasses from the box, to turn the switch on. This serves as a reminder to put on the goggles. Machines are also surrounded by a safety zone consisting of a 2 in. bright red painted border. Any student guilty of being in the same safety zone with the boy who is operating a machine, or if he uses a machine without permission, is dismissed from the shop for a two-week period. Lost work of this kind must be made up later, and a letter is sent home to the parents explaining the case and asking for their cooperation. It is the duty of the shop teacher to protect students and himself against shop accidents and this method provides one of the means.

Metal cabinets house the paint, tools, and supplies. The metal tool cabinets were lined with ¾-in. lumber to provide for toolholding attachments of various types. Projects that are finished are usually placed on a display rack. This evokes considerable interest and stimulates craftsmanship on the part of the student. It also provides the visitor with some idea of what the students are doing. The shop is cleaned up every period by a cleanup squad consisting of a foreman, three boys for the floor, and two for the machines.

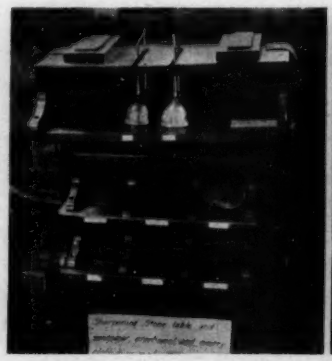


Fig. 6. Sharpening-stone table, and storage racks for sandpaper and steel wool

Fig. 7. Chiseling and boring block attached to bench with a chain

Drawings and sketches for projects are kept in file folders numbered to indicate the grade level, 7th grade general shop to 100, 8th grade general shop 101 to 200, 9th grade general shop 201 to 400, cabinetmaking 401 to 600, advanced general metal 601 to 800, and a letter after the number indicating whether the project is made entirely of wood (W), or metal (M), or is of an electrical nature (E). These are then filed in a cabinet numerically grouped according to the material required for making them. Thus all the 7th-grade projects of wood are filed first in consecutive order after each project has been given a definite number from 1 to 100 with the letter W following the number. The number and name of the project are written on the tab of the file folder. Next to all 7th-grade metal projects are given consecutive numbers from 1 to 100 with the letter M following. Then the 7th-grade electrical projects with letter E following. This marking procedure is followed through for the whole series.

When, for instance, a student in the 8th grade wishes to select a project made of wood, he steps to the file and looks over to the 101 W to 200 W set. After selection and consultation with the instructor he makes a drawing and bill of material for the project. At the end of the period, he returns the folder to the shop secretary, who files it in its previous numerical order. It is then ready for use by succeeding eighth-grade classes or by the same student, later. The method provides for ready accessibility to all project sheets by students at all times.

The Batavia Program of Vocational Education

Nelson J. Murbach

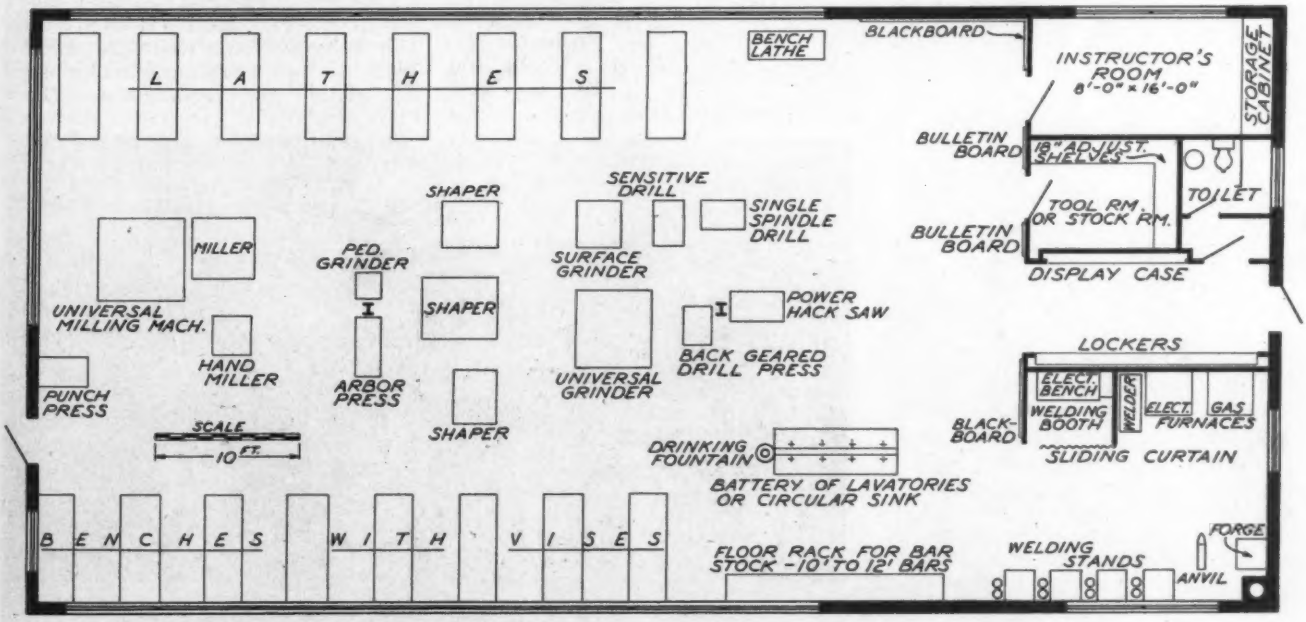
Supervisor of Vocational Education, Batavia, New York

A plan which deserves the careful study of all small- and medium-size communities.

A well-organized program in the general field of vocational education should be based on community needs and interests. In Batavia, for instance, a study of the local situation showed that it would be practical to present vocational education on four different levels to satisfy four different groups. The four levels are: (1) preoccupational training; (2) apprentice training; (3) trade extension; and (4) management training.

Both the manipulative and related work is offered in the day and evening sessions. The teaching methods include the regular class period, lectures, shop visits, and conferences.

Batavia is primarily a metal trades center. Better than 55 per cent of its people are gainfully employed in the metal trades. The workmen so employed can be divided into groups of skilled, semiskilled, and unskilled workers. Investigation has disclosed that the ratio of skilled workmen to the unskilled is greater than that which exists in other communities. The vocational school at Batavia, therefore, was organized so as to give basic training to the youth of the community who want to enter the machinist, diemaking, foundry, welding, and metal patternmaking trades. Batavia does not present unusual aspects, and industrial surveys would show that the same condition exists in other communities although the findings might pertain to different fields of endeavor. In preparing the youth of Batavia for the metal trades, the fact is stressed that, due to individual differences, the right place must be found for each individual student. Not all the students are going to become skilled craftsmen. Some are going to be draftsmen, designers, estimators, but regardless of where they find their places in industry, they must have good preoccupational training which will ground them in shopwork and related technology. If they have these, it is believed that they will get a good general knowledge of the in-



Shop arranged for carrying on preoccupational training, apprentice training, and trade extension work

Shop arrangement showing power lathe and metalworking equipment

dustrial field they are entering. The interest shown at this level of the vocational program by the youth, by industry, and by the community seems to indicate that some day in the near future it will be necessary to organize other courses in preparation for other dominant trades found in the community.

After preoccupational training, apprentice training follows naturally. It is the first concern of the newly indentured apprentice to complete his training so as to be able to qualify as a journeyman. In order to do this, he must not only get the opportunity to develop all-around skill, but he also must master the trade technology. Trade technology consists of the science, the mathematics, the drafting, and the art of his trade. His best opportunity to learn this technology is in the vocational classes. Apprentice classes should be taught by men actually employed in industry and coming to the school from the plants where the apprentices are being trained. In Batavia, regular attendance at these classes is compulsory. Apprentices are made to understand that their advancement depends not only upon their manipulative skill in the shop, but also upon their success in mastering the related theoretical work in the school. The classes and courses are planned to cover the entire four-year indenture period. It may be added that success in such a plan depends upon full cooperation between industry, labor, and the school authorities. Such cooperation is usually assured if the schools can produce evidence of well-organized courses, well-kept records of attendance, and proof of actual accomplishment by apprentices. Most industrial leaders are interested in discovering good material for responsible positions in their organizations and certainly apprentice-training courses create a fertile field for such discovery.

In every community will be found journeymen who are interested in improving themselves. They either want to improve themselves because of necessity or because of personal ambitions. These needs can well be provided for in evening classes. Evening classes of this sort can be either in actual manipulative work, if machines for class use are available, or in theory. In either instance, the work should be taught by an experienced worker enlisted from industry. If, for example, a course in electric and gas welding is to be offered, a skilled and experienced welder should be secured. Courses of this sort may be given as short-unit courses lasting from five to ten sessions, or they may be given as regular courses from 30 to 60 sessions. With an instructor enlisted from industry and having no teaching experience, it becomes the duty of the vocational teacher or supervisor to help him organize his material. This is necessary so that the mechanic can present his work in a logical and interesting way. It is also the duty of the school representative to see that all the necessary equipment is on hand for the successful completion of the course. This holds true not only in shop subjects, but for shop science, mathematics, and the like, as well.

Foremen and supervisors in responsible positions must be constantly on the alert to improve themselves in their positions. In Batavia, the schools attempt to cooperate with the industrial service bureau, of the state department of education, and with local business organizations in setting up educational programs through the medium of group discussions. Most industrial and business firms are anxious to have their key men analyze and discuss their problems. With this fact in mind, a number of discussion groups have been organized. They convene so that they take up part company time, and part of the individual worker's time. A single industrial plant may send enough men to form one group, or several small plants may send delegations to combine in one discussion group. When the meetings occur after working hours, the companies furnish the dinner for the men in a large room secured at a local restaurant where the men meet daily for five days and are trained in the discussion method by a state supervisor. The problems discussed have to do with men, machines, and material. The problem of men and the handling of men in relation to company policy forms the basis for most of the discussions. The men taking these courses are very enthusiastic about them and ask to have them repeated yearly. Naturally these men become stanch and understanding supporters of vocational education. In such a program, the school authorities simply organize the group, the leader comes from the state department, and the accommodations are provided by local firms.

One interesting result of this foreman-training program was the demand by the men for a foreman's club. The aims set up by the men for this club are social and educational. Men working in different

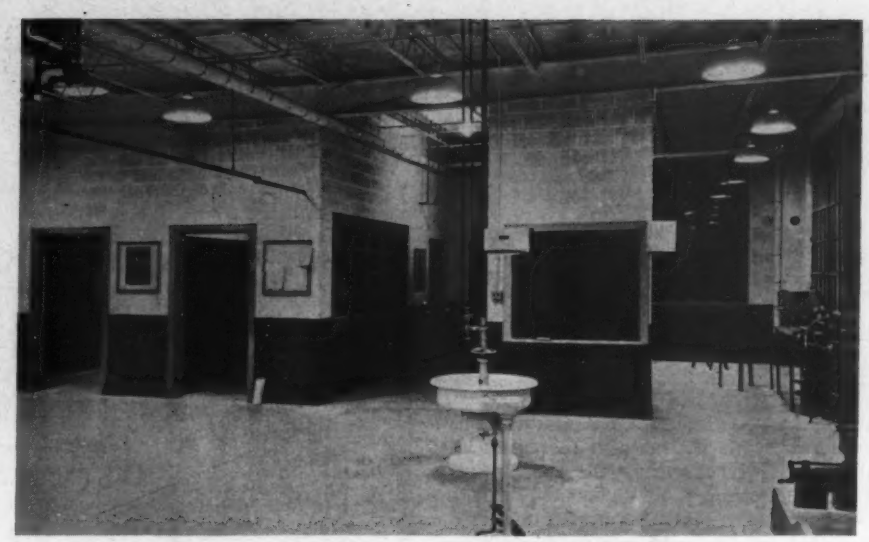
Shop arrangement showing bench equipment at the left. Also circular sink in foreground

plants like to get together from time to time to exchange ideas and to hear what is going on in other shops. Once a month speakers are brought in to these meetings who present talks on such subjects as safety, research in industry, what employees think, metallurgy, taxes and taxation, and similar topics. Working with a committee from such a group, it is well for a shop teacher to act as secretary. It is his duty, then, to send out the notices to the men and to the newspapers, and to help in securing speakers. Through the cooperation of the various companies, most of the speakers appear on the program at no expense to the group. This club idea has been of great help and interest to the men. It requires little effort on the part of any one particular person, but offers much in return.

A phase of vocational work often overlooked is home study. This can be encouraged by the thoughtful selection of the right type of books for a technical library. Again, a shop teacher should assist the librarian in the selection of books. Suggestions from the men as to the books they have found helpful should also be encouraged, in order to develop the right kind of library. A list of the books should be made and posted in the various factories. This list should be revised at least every six or seven weeks. Our response to this feature has been splendid. The chief difficulty at Batavia is to secure enough books to go around.

Organization in every phase of a vocational-education program requires thought and preparation. At Batavia it has been found fruitful to talk over the educational plans with interested individuals and civic groups. The local chamber of commerce also has been of great assistance.

The first step in the program was the organizing of the apprentice and evening related trade-extension courses. These courses were organized with the assistance of a committee appointed by the chamber of commerce. After these courses had proved themselves, the committee saw the need for preoccupational training for day-school students as preparation for apprenticeship. Because this assisting committee was so wisely chosen and because it rendered such valuable service, it was later made a permanent advisory council on vocational education.



View showing instructor's room, tool room, and welding booth. The welding stands are shown at the right

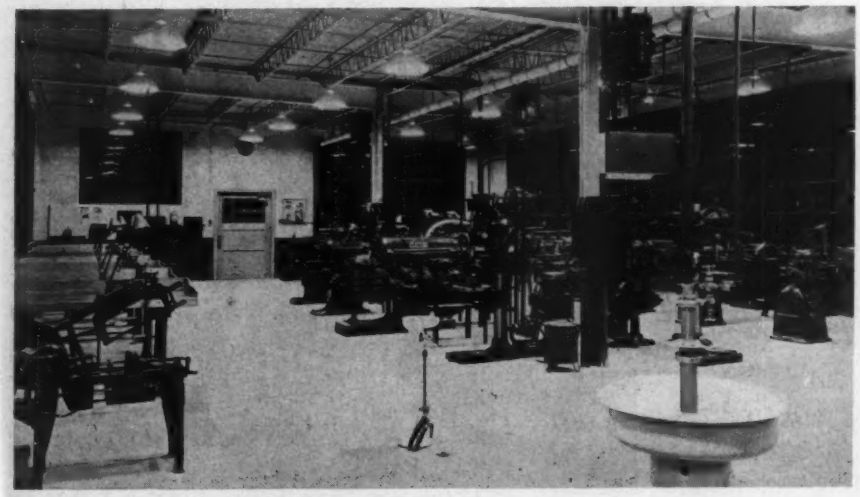
What seems to be a need must often be proved to the taxpayers of the community. With this idea in mind, the chamber-of-commerce committee conducted a very comprehensive industrial survey which proved conclusively that there was a need for preoccupational training in Batavia. The results of the survey were then presented to the board of education who in turn presented it to the taxpayers. The taxpayers voted three to one in favor of an expenditure of money for a vocational school. An addition was constructed to one of the grade schools and the classrooms were suitably equipped. The school now houses both the day and evening classes. It is becoming more and more evident that present facilities will be outgrown in a few years, because of the constantly increasing registration.

In looking to the future, distributive-trades courses will soon have to be added to the curriculum. The merchants' council of the chamber of commerce is interested in such courses and it recognizes a definite need for them.

The courses offered at Batavia not only attract local people, but also people from near-by communities. Both day and evening enrollments show attendance from communities as far as fifteen miles away. Men employed in industrial organizations outside of Batavia avail themselves of the opportunity of attending the foreman's meetings. The result is that the program of vocational education is receiving support throughout the county.

It might be well to point out that through the judicious use of student fees, and state, federal, and local funds, the program may be carried out without placing a great burden on any one group. Of course, such a program can succeed only through the continuous cooperation of large groups of interested persons. To sustain this interest, it is necessary to keep the public informed at all times. This is done through newspapers, committee reports, school news letters, and talks before civic groups.

The entire program is dedicated to serving the vocational-education of its community.



View toward the bench work section

Twenty-five years ago you could have counted the number of companies that had industrial research laboratories on the fingers of your hands. Today we have over two thousand. . . . It is an expression of their determination to find out more about their business and, in so doing, they are going to do the one thing that is most essential to our industrial and social vitality. — *Charles F. Kettering.*

Traip Academy General Shop

Charles S. Allen

Kittery, Maine

Layout of a general shop for a high school in a small community.

The small town of Kittery is located at the extreme southern part of Maine, bordered by the Atlantic on the east and the Piscataqua River on the south. The United States Navy Yard commonly called the Portsmouth Navy Yard is located near this town on an island on the Maine side of the river channel which is the border line between Maine and New Hampshire.

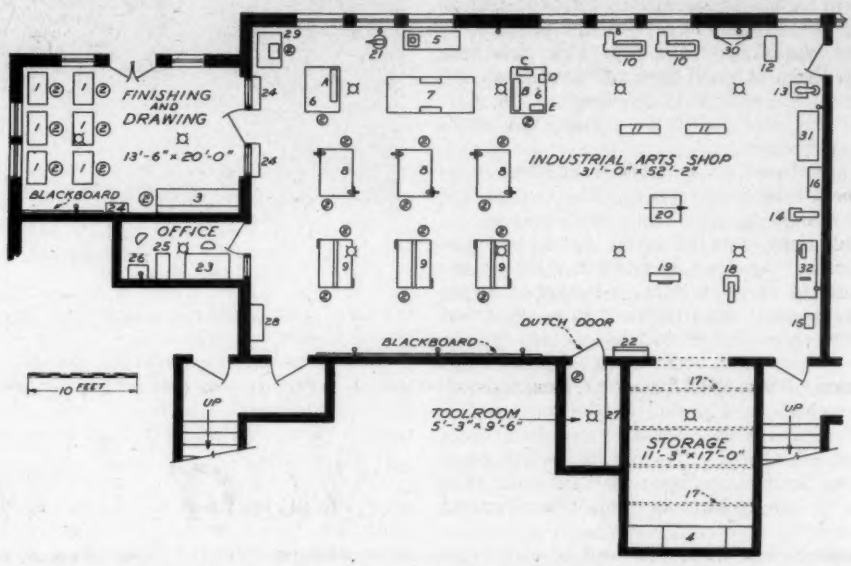
This town has never had a school shop for its boys. Money was left to the Traip Academy for a memorial gymnasium and with these funds, plus additional funds furnished by the town, it was possible to add to the gymnasium a room for shop classes and home-economics classes. The new building was completed early in the fall of 1939 and the classes moved in on the first of November.

The plan and illustrations show the results of the combined efforts of the town, Academy, and others responsible for the completion of the project.

The shop was designed to meet the needs of the boys of the town who largely become navy-yard workers. It seemed desirable to establish a general shop for the secondary school; namely, Traip Academy. It was decided to start with a four-activity shop to which other related activities could be added in the future. General drawing, general woodworking, sheet-metal work, and machine-shop practice were chosen as the basic departments.

It was decided to have a maximum of 24 students in each of three classes, and equipment was planned with that number in mind. It will be noticed in the plan that there are 6 drawing stations, 6 woodworking stations, 6 machine-shop stations, and ample space at the sheet-metal benches for 6 students.

The plan of classwork organization requires that the students rotate through the four departments during the year thus remaining in each department 9 weeks. All classes are to be treated similarly this year. In another year boys will elect shop for the second time, but the plan is to continue with the rotating-group work of an advanced type during the second year and possibly allow boys in the senior year to



KEY TO PLAN, TRAIP ACADEMY GENERAL SHOP, KITTERY, MAINE

1. Mechanical-drawing tables (3-class type); 2. Stools; 3. Finishing bench (storage below, shelf above); 4. Storage shelves for projects; 5. Metal covered bench with soldering furnace; 6. Plain top machinists' benches (double type with 16 drawers); A. Bench brake, B. Forming rolls, C. Double-seaming machine, D. Setting-down machine, E. Combination rotary machine; 7. Sheet-metal workers bench with stake plates (storage below); 8. Plain top machinists' benches with vises (Double type with 16 drawers); 9. Woodworking benches with vises and bench dog (Double with 16 drawers); 10. Screw-cutting engine lathes (South Bend, One Model A and One Model B pedestal-drive leg lathe with oil pan and guards); 11. Wood-turning lathes (Delta, one 16 speed and one 4 speed); 12. Metal shaper (Atlas 7 in. with all guards and stand); 13. Drill press (Delta 14 in. with foot feed and guards); 14. Scroll and jig saw (Delta multi-speed); 15. Pedestal grinder (Delta); 16. Sink. 17. Overhead lumber and storage rack (2-in. pipe wall to wall); 18. Combination wood- and metal-cutting band saw (Delta 14 in.); 19. Jointer (Delta 6-in. cast-iron base); 20. Tilting-arbor circular saw (Delta 10 in. with extension tables); 21. Anvil (100 lb.); 22. Shelves for nail and screw bottles; 23. Instructor's desk; 24. Bookshelves; 25. Filing cabinet; 26. Steel storage locker; 27. Tool cabinet (Counter, drawers, and cupboards below, panel on wall); 28. Display case; 29. Bench for surface plate; 30. Tool cabinet for lathe and shaper tools; 31. Bench for portable-sander stand; 32. Bench for miter box and oilstones

View looking toward the storageroom and the toolroom

View looking toward the drawing room

The sheet-metal section

The woodworking section

specialize in the department which interests them most.

A shop superintendent is elected by class ballot to help with details of organization. Foremen for each department are appointed by the instructor to help with instruction in the various departments. The woodworking department is assigned to toolroom duty. Each member of the department takes his turn in succession as toolroom clerk and as the different groups come into the woodworking department, each boy in each class will have his turn in the toolroom. A clean-up system has been worked out whereby each student will have a specific duty to perform at the end of each working period, the assignments being changed from time to time.

Over 50 per cent of the boys in Traip Academy are now being given the advantages of this general shop.

Expanding the Field

A Program of Adult Education

H. P. Harshbarger

Director, Department of Practical Arts and Principal of Adult Evening School, Maine Township High School, Des Plaines and Park Ridge, Illinois

A description of how an effective evening-school program was instituted and conducted.

In the mind of the writer the adult-education movement will come to have a cherished place in the heart of most communities. No doubt the general educational system of today and tomorrow will and can benefit in untold measures by having the adult population back in school again.

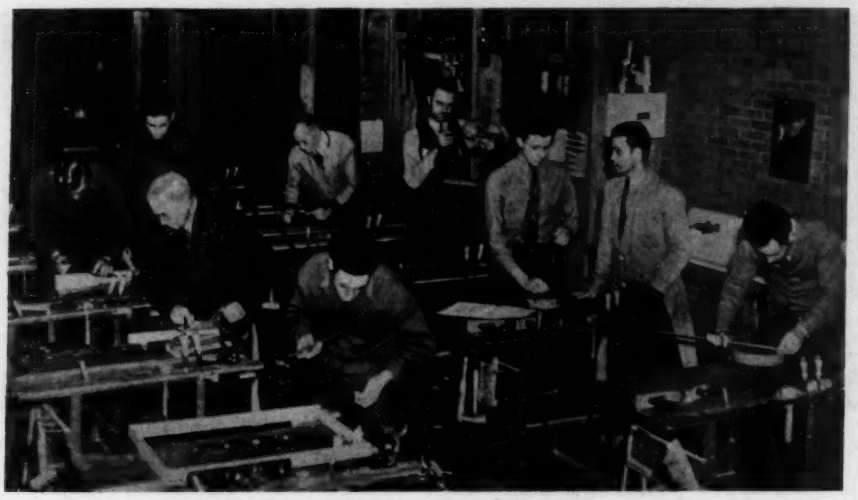
What is Adult Education?

As very effectively and ably stated by the San Jose, Calif., adult center: "Adult Education is neither elementary, secondary, nor college education. To the old time school man and others who think of education only in terms of institutional grades this is a puzzling statement.

"Adult Education is, allied to, and chief among, those countless activities which mature men and women engage in during their adult life in the pursuit of adjustment and knowledge. Service clubs, women's clubs, social service organizations, lodges, choirs, orchestras, parent organizations, libraries, unions, trade associations, civic associations, study clubs — in all of these, men and women meet and grow in a greater understanding of their fellow men, their community, and themselves.

"Adult Education is all of these combined — an institution closely allied with

Adult class in meal planning



A small section of the adult woodshop

the deepest impulses of the mind toward self-education. Here are the riches of the cultural world, but riches reorganized and revitalized. Here they are not, however, the routine, the lack of inspiration, the too frequent drudgery, the ringing of bells, and the changing of minds willy-nilly when bells are rung. Here is nothing of the tread mill of learning, and none of the measurement of one man against another in routine examinations and uninspired quizzes."

Adult education is therefore a part of the natural culture of the people, creative, expansive, adjustive, and continuous. It does not look toward formal degrees; it cultivates friendship and more gracious living instead of status and seclusion.

Trends in Adult Education

"It's Fun To Be Intelligent" is the leading headline on a recent handbook for adult education on the west coast. From an all-free adult evening program in Michigan comes the folder urging: "Pursue your hobby"; "Pursue recreation"; "Seek learning in new and old fields"; "Live a fuller and happier life."

In an effort to meet average conditions and demands of the adult group there seems to be a tendency to swing away from traditional subject-matter fields. Following are a few of the newer type courses being offered in various localities: "Money and the common man"; "American personalities"; "Father and son fixit shop"; "Newspaper night"; "Economic life"; "Keeping yourself attractive"; "Creative pottery"; "After motion pictures, what?".

Industrial-Education Adult Programs

Even though schools throughout the country cater to all phases of new adult life as dancing, movie appreciation, story-telling, home beautification, etc. — industrial education plays a great part in the success and continuation of any adult program.

From one section of the country comes the word that "welding is our most popular subject" — from another "typing is favored especially" — and yet another "industrial subjects form the backbone of the program." Local industrial life and community enterprises will, of course, determine those subjects that are most in demand.

Including all angles of industrial and practical arts a few of which are woodwork, machine shop, electricity, drafting, pottery, art, clothing, meal planning, printing, photography, etc., it is safe to say that 50 per cent of adult students tend toward enriching the recreational side of living, while the other 50 per cent definitely are trying to better themselves in their position.

Women are found working in ornamental iron and woodwork, while many men enjoy creative pottery and meal planning.

Experiences in Organizing a Local Program

The board of education of Maine Township High School representing the cities of Park Ridge and Des Plaines, Ill., instructed the principal that they desired and expected a program of adult evening school in the township. They also indicated that they would stand all building, equipment, heat, and light expense but that teachers' salaries should be paid, if possible, from student fees.

Maine Township covers some thirty square miles of territory and has a population of about 30,000 people. The high school is situated in the exact center of this area on 58 acres of campus — about 17 miles northwest of Chicago's loop. The township is approximately half residential and half truck farming.

I. *Determining the Course of Study*

1. Questionnaires were published in all local newspapers and letters were sent to all local civic and community organizations and churches. Provision was made so that requests could be mailed or phoned to the high-school office.

2. After a tentative course of study was decided upon, an attractive folder was printed and circulated from house to house with the following information:

a) Name of each course to be offered with complete contents described so as to be readily understood by everyone.

b) Time of courses.

c) Nights and length of time each evening.

d) Location of instruction room numbers.

e) Fees and regulations.

II. *Publicity*

1. Placards made by the sign department were distributed through the community.

2. Newspaper publicity was handled through the department of public relations.

3. Paid advertising was circulated through local papers and other publications.

4. Printed slides were shown at local theaters.

III. *Enrollment*

1. The exact time and place of enrollment was broadcast freely.

Portion of adult poster and sign writing class

2. A four-dollar fee per student was decided upon for the ten-week term. This included instruction for two hours per evening on Tuesday and Thursday, a total of 40 hours for the term.

3. A small registration card was printed in duplicate and fees were received over the signature of the office help. Half of the registration card was retained by the office and the receipted half was used by the student for admission to class.

4. Teachers were in their rooms on the two registration evenings in order that prospective students might have firsthand information concerning each course. Teachers served without pay on these two evenings.

5. Each incoming student was provided with a sheet of registration instructions including courses offered, room numbers, and names of instructors.

6. Classes were operated with as few as twelve students enrolled.

IV. *Checking Attendance*

1. Each teacher was expected to record attendance nightly and report to the office on a sheet provided for that purpose.

2. Regularity of attendance was dependent to a great degree on the instructors' ability and personality.

3. A double mailing card system was used for checking absentees. This, of course, was in the form of a friendly reminder.

4. A monthly report was made to the board of education concerning attendance, finances, etc.

V. *The Teaching Staff*

1. Character.

a) Instructors in adult evening school must be honest, ambitious, responsible, and above all, human.

2. Personality.

a) The successful teacher brings pupils back each time, even though they may not be particularly interested in the subject.

b) Teachers must have the desire to teach in evening school. They must want to mix with adults. Experience has shown that day-school teachers should not be urged to teach in evening school. There are plenty of talented persons in any community that are capable and anxious to give this instruction. Some schools will not permit day teachers on the night program.

3. Experience.

a) Teachers must have knowledge of the subject and know proper instructional methods.

b) Teachers seem best qualified who have previously taught either children or adults.

c) It has proven decidedly important, especially in industrial subjects, that instructors have practical experience in their field.

4. Compensation.

a) The administration established the set salary rate of two dollars per hour for teaching night classes.

VI. *Administration*

1. Authority was given by the board of education through the principal to appoint a director of the adult evening program. The writer has had the privilege of serving in this capacity.

2. Office help has been furnished from the regular day-school staff.

VII. *Closing the School Year*

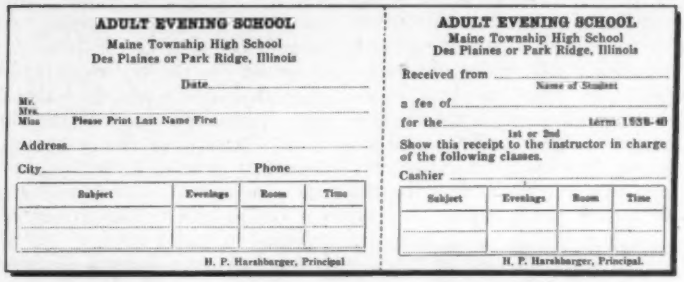
1. To students wishing a certificate of attendance, a small special diploma indicating clock hours has been awarded to those who attended 36 of the 40-hour course. This award has proved very practical as a great many of these people have never had the opportunity to earn any kind of an award.

2. Students who need high-school credit and who satisfactorily cover the requirements, under a teacher's supervision, are given regulation unit credit.

Through the many contacts with other schools and through experiences gained in the local situation one significant fact seems to stand out — that the success of any adult-education program depends upon the attitude of the teaching staff.

The writer is thoroughly convinced that there is no better way to sell the high school to the community than through a good adult program. Every enterprise demands a sales program and school need be

One corner of the general metal shop of the adult evening class



ADULT EVENING SCHOOL
Maine Township High School
Des Plaines or Park Ridge, Illinois

Date.....

Mr.
Mrs.
Miss Please Print Last Name First

Address.....

City..... Phone.....

Subject	Evenings	Room	Time

H. P. Harshbarger, Principal

ADULT EVENING SCHOOL
Maine Township High School
Des Plaines or Park Ridge, Illinois

Received from .....
Name of Student

a fee of.....

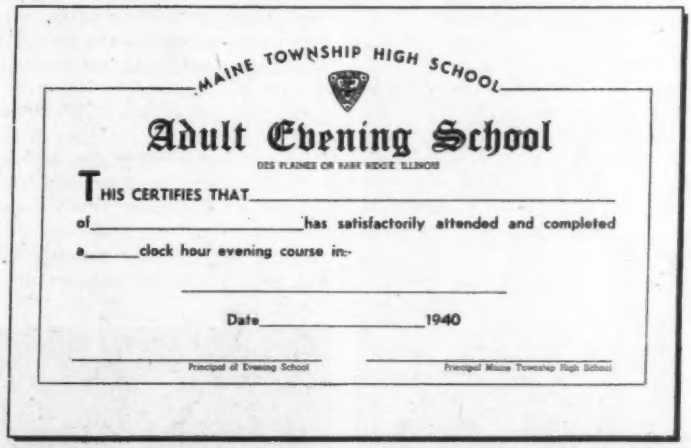
for the.....term 1938-40
1st or 2nd

Show this receipt to the instructor in charge of the following classes.

Cashier .....

Subject	Evenings	Room	Time

H. P. Harshbarger, Principal.



MAINE TOWNSHIP HIGH SCHOOL

Adult Evening School

DES PLAINES OR PARK RIDGE ILLINOIS

THIS CERTIFIES THAT.....

of.....has satisfactorily attended and completed

a.....clock hour evening course in:-

.....

Date.....1940

Principal of Evening School

Principal Maine Township High School

no exception. Industrial education deserves to be advertised.

The adult program should be planned for and by the students. They should be permitted to change classes freely in accordance with their likes and dislikes. In the planning of any program of adult education the first essential seems to be the creation of a friendly, warm, social spirit in and around the student body. Instructors must be guided by the wants and desires of the individual.

The ideal plan seems to point to development whereby thousands of community folk have the opportunity to get away from the traditional cold, fearful, restricted classroom and come to experience the pleasant glow that comes from meeting old friends, and making new ones in a stimulating, natural learning environment, where even the subject matter is enticing.

Diversified Occupations in Covington High School

Alan L. Beamer

Vocational Co-ordinator,
High School,
Covington, Virginia

A description of the method of inaugurating diversified occupation courses in a high school of a small community.

Four years ago our high school had its first opportunity to offer its students a practical type of training. We installed an industrial-arts department which included courses in woodwork, general metalwork, and mechanical drawing. The courses proved to be so popular and so beneficial to the students of this industrial community that in the following three years a complete general shop was installed. The students can now take training in woodwork, machine-shop practice, foundry, printing, elementary electricity, electric welding, and mechanical drawing.

Industrial arts fitted into our curriculum 100 per cent, but only on the exploratory side where the student was given a variety of experiences in the fields relating to industry and everyday problems of life. We know good education should be functional and could readily see where our graduates lacked something in facing life's problems. To offer straight vocational training would be impossible in a community where only a small per cent of the students could be absorbed by the different trades. Acting upon the capable advice of Dr. B. H. Van Oot, State Supervisor of Trade and Industrial Education of Virginia, and Division Superintendent A. L. Bennett, we enriched our curriculum by offering a course in *diversified occupations* to our juniors and seniors.

In 1931 the Federal Board for Vocational Education made a further modification of policy on part-time cooperative courses which permits the establishment of similar courses for young workers from a variety of occupations instead of from stores and offices only. Many states are confronted with the problem, in the smaller cities and towns where the employment opportunities are so diversified and miscellaneous in character as to preclude the feasibility of establishing unit trade courses, or providing training to fit boys and girls for useful employment.

The program of vocational education for diversified occupations in a part-time cooperative program of education in which the business establishments in the community cooperate with the school authorities is providing work experiences and vocational instruction for a selected number of high-school students.

A. Machine shop practice, B. Printing, C. Plumbing

D. Occupational science, E. Bookkeeping

F. Auto mechanics, G. Mortician, M. Seamstress

COVINGTON HIGH SCHOOL
Diversified Occupations

Trainee Daily Work Report

Student's Name Student C

Training Agency: John Doe

Week Beginning Jan. 22 Ending Jan. 28

What Job I Did	Hours Worked	What I Need to Know
Sunday		
Monday - Put in new range boiler. Installed a lavatory at cafe.	4½	How to take apart and put together gas water heaters.
Tuesday - Took out heating system at old Cook home.	4½	
Wednesday - Took out heating system at old Cook home.	4½	
Thursday - Dug a ditch for sewer line system at Cook garage.	4½	
Friday - Put hot water coil in furnace.	4½	
Saturday - Threaded soil pipe at shop.	4½	

COVINGTON HIGH SCHOOL Diversified Occupations — Students Daily Report Card

Student's Name Student C

Training Agency John Doe

Report from Jan. 22 to Jan. 28

	In	Out	Time Worked	Work Experiences
Sunday				
Monday	1	5:30	4½	Put in range boiler
Tuesday	1	5:30	4½	Took out heating plant
Wednesday	1	5:30	4½	Took out heating plant
Thursday	1	5:30	4½	Dug a ditch
Friday	1	5:30	4½	Put coil in furnace
Saturday	7:30	12:00	4½	Threaded pipe
Total Hours Trained 27			Total Hours Lost 0	Total Week Earnings $6.75

Trainee's daily and weekly report

FORM D. O. 4

NAME OF STUDENT Student C — PLACE OF TRAINING John Doe Plumbing and Heating

TRADE OR OCCUPATION Plumbing - Heating — CONTACT OFFICIAL John Doe

DATE OF ENTRANCE September 11, 1938 — PHONE NUMBER

OCCUPATIONAL EXPERIENCE	WORK HOURS						T	WORK HOURS						T	WORK HOURS						T
Measuring pipe																		9			9
Cutting, reaming, threading	4½			4½			9				27			27	3½						52½
Installing pipe hangers																					
Setting Risers			4½				4½					4½		4½							
Caulk, repairs	4½		4½				9														
Installing gas range																					
Installing range boilers	4½						4½	4½						4½							
Installing hot water coil	4½						4½														
Mix cement		4½					4½									9					9
Installing cellar pump		4½					4½														
General repair work		4½	4½		4½		13½	4½	4½					9							
Remove old heating plant	9						9														
Seal melting plat																		4½			4½
Answering telephone																				9	9
Cutting cast iron pipe																					
Soldering joints																					7½
Installing bath tub																		4½	3		
Took inventory																			17		17
Install sink																			6		6
Cleaned up shop			4½		4½		9	9	9					18							
Dug ditch																		4			4
Install coil in furnace																			9		9
Laying sewerage lines	4½			13½	9		27				9			9							
Leading main water line		4½					4½														
Install gas tank		4½		2			6½					4½		4½							
Repaired radiators				2½			2½	4½				9		13½							
Cleaned plumbing				4½			4½														
Cleaned drain lines				4½	4½		9														
Hauled freight				4½			4½														
Installed water main				4½			4½	9		18		9		36							
Cut cement					9		9		4½					4½							
Worked on bookkeeping in shop						13½	13½	13½	4½					18		13½	4½	9			27
Helped truck broken									4½					4½							
Ran 3" steam main										13½				13½							
Drilled holes thru brick wall												9		9							
Connected unit laundry tubs												9		9							
Applied asbestos covering												9		9	27½	4½	4½				31½
Installed 3 oil burners												9		9							
Painted pipes and boiler																13½	13½				27
Covered boiler with cloth																	9				9
Total Hours	31½	13½	8	27	9	13½	157½	31½	27	31½	36	36	36	202½	55	44½	31½	31	15	27	200

Occupational experience report

Only students fourteen years of age, who have earned at least eight units toward graduation, and who have obtained the consent of their parents or guardians, are eligible for enrollment.

When the student employee enters the program, he continues to pursue at least two additional academic subjects during each of the remaining years in school. Also the student must spend at least two periods each day in school studying occupational science including economic and social problems and specific information related to the vocation in which he is placed. He spends at least fifteen hours a week working under supervision in some store, office, bank, machine shop, garage, industry, or other place of employment.

Only those placement agencies are selected that offer satisfactory training opportunities. An analysis of the training opportunities in each cooperating agency is made and the employer must agree to shift the student employee at stated intervals so that the student employee will gain experience in the various phases of the vocation. After a reasonable probationary period, the student must be paid a monetary wage at a rate comparable to wages paid other employees.

The common question asked by school administrators and businessmen is, What advantages does such a program offer the student, school, community, and employer?

SUMMARY OF EMPLOYER'S REPORT ON TRAINEES

Covington High School

A. L. Beamer (Coordinator)

REMARKS

Date: Jan. 22 to Mar. 4

	Trainees Name	RATING POINTS	Is he prompt? Yes	Is he prompt? No	Is he reliable? Yes	Is he reliable? No	Is he interested in the job? Yes	Is he interested in the job? No	Is he making reasonable progress? Yes	Is he making reasonable progress? No	Does he follow instructions? Yes	Does he follow instructions? No	Does he show initiative? Yes	Does he show initiative? No	Does he show interest in the company? Yes	Does he show interest in the company? No	Does he keep busy? Yes	Does he keep busy? No	(General Rating) First Class, Good, Average, Poor, Improving.	(Skill Rating) Outstanding, Average, Poor, Not Adapted, Improving.
1	Student A		x		x		x		x		x		x		x		x		Good	Aver.
2	Student B		x		x		x		x		x		x		x		x		Good	Impr.
3	Student C		x		x		x		x		x		x		x		x		F.Cl.	Outs.
4	Student D		x		x		x		x		x		x		x		x		Good	
5	Student E		x		x		x		x		x		x		x		x		Impr.	Impr.
6	Student F		x		x		x		x			x		x		x	x		Aver.	Aver.
7	Student G		x		x		x		x		x		x		x		x		Good	Impr.
8	Student H		x		x		x		x		x		x		x		x		Impr.	Aver.
9	Student I		x		x		x		x		x		x		x		x		Good	Aver.
10	Student J		x		x		x		x		x		x		x		x		Good	Good
11	Student K		x		x		x		x		x		x		x		x		Good	Aver.
12	Student L		x		x		x		x		x		x		x		x		Impr.	Aver.
13	Student M		x		x		x		x		x		x		x		x		Aver.	Aver.
14	Student N		x		x		x		x		x		x		x		x		Good	Aver.
15	Student O		x		x		x		x		x		x		x					Aver.
16	Student P		x		?		x		x		x		x		x				Good	
17	Student Q		x		x		x		x		?		x		x		x		Good	Aver.
18	Student R		x		x		x		x		x		x		x		x		Impr.	
19	Student S		x		x		x		x		x		x		x		x		F.Cl.	
20	Student T		x		x		x		x		x		x		x		x		Aver.	Aver.
21	Student U		x		x		?		?		x		x				x		Aver.	Aver.
22	Student V		x		x		x		x		x		x		x		x		Good	Aver.
23	Student W		x		x		x		x		x		x		x		x		Aver.	Aver.
24	Student X		x		?		x		x		?		x		x		x		Aver.	Aver.

Summary of employer's report

Advantages to the Student

1. Offers an opportunity for boys and girls to learn much about a vocation while still attending school.
2. Helps students to choose suitable vocations.
3. Provides training on real jobs under actual working conditions.
4. The students are given the opportunity to secure information related to occupations at the proper time.
5. Gives them an opportunity to advance in a selected occupation.
6. Offers an opportunity to students to finish high school and go to college if they so desire or they may capitalize on their experiences in getting permanent work.
7. Opportunity to enter and learn a vocation at an early age.
8. Arouses student's interests that might otherwise lay dormant.
9. Students are offered guidance under practical conditions.
10. Provides for and develops new attitudes toward responsibilities.
11. Encourages correct work habits.
12. Helps to bridge the idle gap between school and work for students who complete the program.

STATE DEPARTMENT OF EDUCATION

Trade and Industrial Department

Coordinator's Report

School Covington High School Date Jan. 22 to Mar. 4

City Covington, Virginia

Trades or Occupations	Boys	Girls	Total Earnings	Remarks
Auto Mechanics	3		$54.32	Boys progressing fine.
Plumbing & Heating	2		58.35	
Baking	1		47.38	Boys will have job on graduation.
Printing	2		44.81	
Carpenter	1		9.95	Lost time due to illness.
Machinist	1		14.70	
Motion Picture Projection	1		12.00	Boy is able to make throw-overs.
General Office Work	1	2	38.14	
Store Clerks (Krogers)	1		12.60	New placement.
Drug Store Clerks	2		60.00	
Cut Rate Store Clerk	1		23.00	
Dept. Store Clerk		1	13.10	Wage is equal to 5% of sales.
Mortician	1		20.50	
Dentist Assistant		1	8.00	New placement Lost time(Ill).
Seamstress		1	16.47	Good placement.
Filling Station Attendant	1		10.50	Usual case, things going good.
Soda Fountain Clerk	1		23.75	Boy is slow in books.
Totals	19	5	$467.57	

Coordinator *Alan L. Beamer*

Coordinator's report

EMPLOYER'S REPORT ON TRAINEE

Date: Jan. 22 to Mar. 4

Name: Student C Training Station: John Doe, Plumbing & Heating

Rating Points	Check Yes	Check No	REMARKS
Is he prompt?	✓		
Is he reliable?	✓		
Is he interested in the job?	✓		
Is he making reasonable progress?	✓		
Does he follow instructions?	✓		
Does he show initiative?	✓		
Does he show interest in company?	✓		
Does he keep busy?	✓		

General Rating (check one)

In General: First Class; Good; Average; Poor; Improving;
Skill: Outstanding; Average; Poor; Not Adapted; Improving;
Note: Other remarks on back Signed:_____

Employer's report

Advantages to the School

1. Offers a vocational-training program for schools in small towns and communities.
2. Keeps boys and girls in school longer.
3. Broadens the high-school curriculum.
4. Offers economy in plant equipment and operation.
5. Provides an opportunity for the school to give more functional subject matter.
6. Provides an excellent opportunity to teach citizenship.
7. An opportunity is offered to render a real service in guidance.

Advantages to the Employer

1. Offers an opportunity to secure and train desirable types of workers.
2. The school teaches the necessary technical information.
3. Opportunity to obtain employees who understand proper employee and employer relationships.
4. Provides workers who are interested in learning a trade.
5. Provides high-school graduates as employees.
6. Provides employer with the privilege of changing any student if they prove to be unsatisfactory.
7. Trained workers are more likely to stay on the job.
8. Individuals are selected to training.

Advantages to the Community

1. Makes better and more useful citizens because of supervised and superior training at an early age.
2. Less loafing and street walking by the young people.
3. Moral and social conditions improved.
4. Fewer social-service problems.
5. Keeps home boys or girls in home-town jobs.
6. All classes of students have the same opportunity.

To summarize the work done last year is very simple.

Number of pupils on this diversified occupations program	24
Number of boys in program	19
Number of girls in program	5
Number of pupils dropped	1
Number of pupils transferred from one type of work to another	3
Total different types of vocations	16
Total hours worked by pupils	16,246
Total earnings of pupils	$2,895.11

These pupils were trained in the following trades:

Automobile mechanics	3
Plumbing and heating	2
Baking	1
Printing	2
Machinist	1
Carpenter	1
Motion-picture operator	1
Mortician	1
Filling station and repairing	1
Bookkeeping	1
General office work	1
Department-store clerk	1
Cleaning and pressing	1
Dentist's assistant	1
Drugstore clerk	2
General store clerks	3

It is interesting to note that 18 of these pupils were retained during the summer vacation, by those for whom they worked during the school year.

At least some of these pupils had an altogether different outlook on life and on their schoolwork when they were placed in a type of work for which they were fitted and in which they were interested. In such a program it is much easier to make personal adjustments because the student and the school have something tangible to work with.

Points to be Observed by Co-ordinator When Visiting a Training Station

Training Station .....
Contact Official .....
Trainees .....
Date ..... Time of Visit .....

1. Conditions surrounding the place of business.
2. Hazardous conditions in the plant.
3. Attitude of *workers* toward co-ordinator and trainee.
4. Specific operations in which trainee is engaged.
5. Related subject matter that should be taught at school to assist the trainee immediately.
6. Personal appearance of trainee.
7. Apparent interest of trainee in work.
8. Apparent interest of employer in trainee.

Improving Instruction

Teaching Related Information in Woodworking

Harold M. Gray

Northeast Junior High School, Kansas City, Kansas

A useful analysis of the related information to be found in a woodworking course and the means to be used in teaching it.

It is almost universally accepted that any related information should be divided into information or teaching units. This idea was advanced by Professor Selvidge in the "Standards of Attainment In Industrial-Arts Teaching." When "information units" have been listed, it is then time to decide what procedure is going to be used to teach each unit. There are a great many procedures that any instructor may use. The author of this article has used the procedures herein shown on this chart.

The advantages of such a chart to the instructor of industrial-arts are:

1. The instructor can readily see the number of methods, aids, and procedures available for teaching related information in woodworking.

2. By having such a chart, the instructor may be able to choose more readily the method, aid, or procedure that can be used to teach certain types of pupil groups or pupils or classes.

3. The instructor may readily see what methods, aids, or procedures are best suited to teaching each information unit.

4. This serves as one kind of a lesson plan for all related information that is to be taught.

5. This is an analysis of each item of information into devices, methods, aids, and procedures by which they may be taught.

The methods, aids, devices, and procedures shown on the chart are only some of the many that may be used in teaching related information. A brief explanation as to how each may be used is of value in understanding the purposes of the chart. A demonstration is necessary in imparting almost any form of information in the industrial-arts laboratory. Sometimes, if

Teaching Related Information in Woodworking

INFORMATION UNITS	Demonstration: Instructor	Demonstration: Pupil	Lectures: Instructor	Lectures: Outside Authority	Visual Aids: Motion Pictures	Visual Aids: Photographs	Visual Aids: Charts	Visual Aids: Drawings	Visual Aids: Display Boards	Visual Aids: Slides	Visual Aids: Organizations	Instruction Sheets: Operation Sheets	Instruction Sheets: Information Sheets	Instruction Sheets: Assignment Sheets	Tests: Objective	Tests: Essay	Discussions: Teacher	Discussions: Pupil	Reports: Required	Reports: Non-required	Projects: Classroom	Projects: Home	Problems: Classroom	Problems: Home	Published Material: Pamphlets	Published Material: Bulletins	Models: Incomplete	Models: Complete	Clubs: Woodcraft	Clubs: Indus. Arts Society	Excursions: Around School	Excursions: Outside School	Notebook: Pupils	Notebook: Classroom	Notebook: Pupils	Library Reading
1. Shop organization in industry	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
2. Benefits of shop organization	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
3. Tool room care	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
4. Lumber room care	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
5. Finishing room care	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
6. Care of equipment	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
7. Checking out supplies	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
8. Making a project plan	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
9. Safety with tools	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
10. Working drawing dimensions	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
11. Types of drawings used by workmen	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
12. Identification of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
13. Characteristics of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
14. Uses of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
15. Cutting and milling of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
16. Age and defects of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
17. Seasoning of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
18. Dimensions of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
19. Grades of lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
20. Effect of moisture on lumber	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
21. Kinds, uses, and sizes of nails	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
22. Manufacture and sale of nails				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
23. Sizes and uses of brads				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
24. Kinds, uses, and sizes of screws	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
25. Manufacture and sale of screws				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
26. Kinds and uses of fasteners	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
27. Kinds and uses of hardware	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
28. Figuring board feet	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
29. Object of wood finishes	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
30. Kinds, uses, and sizes of sandpaper	✓			✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
31. Manufacture of sandpaper				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
32. Grades and uses of steel wool	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
33. Manufacture and uses of shellac				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
34. Manufacture and use of varnish				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
35. Manufacture and use of paint				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
36. Manufacture and use of stain				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
37. Source and use of turpentine				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
38. Source and use of alcohol				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
39. Source and use of linseed oil				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
40. Grades of varnish and shellac				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
41. Manufacture and use of wax				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
42. Wood fillers				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
43. Finishing driers and thinners				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
44. Manufacture and use of lacquer				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
45. Uses of spray gun	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
46. Care of spray gun	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
47. Properties of woods	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
48. Manufacture and use of panels				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
49. Manufacture and use of glue				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
50. Preparation of glue				✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
51. Kinds of polishes and uses	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
52. Kinds of joints and uses	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
53. Manufacture and use of inlay		✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
54. Manufacture of veneer		✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
55. Upholstery covers	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
56. Upholstery padding	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
57. Kinds of period furniture	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
58. Furniture design	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
59. Forest areas in U. S.	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
60. Uses of machines		✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
62. Range of work on machines	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
63. Care of machines	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
64. Location of furniture factories	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
65. Division of labor in industry	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						
66. Opportunities in woodworking		✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓						

Procedure chart

pupils in the class can perform a needed demonstration to other members of the class, it is better to let them do it, providing they can do it correctly and systematically, without forgetting to cover every important detail. One can readily see the advantages in a pupil demonstration as well as a demonstration by the instructor. Demonstrations may be given in three ways; namely, to individuals, to groups, and to the class as a whole.

Lectures may be given by the instructor or some other individual who is either an authority or who is very familiar with the subject in question. Each has its advantages, when a need arises for it. When an outside individual is to give the lecture, the instructor should see to it that he has an outline of the points to be emphasized before time so as to insure adequate and timesaving delivery.

The group of instructional aids known as *visual aids* have come to be a very important method of conveying certain types of information to pupils. Aids which come under this head are motion pictures, photographs, charts, drawings, display boards, slides, and dramatizations. Motion pictures can best teach certain information units which cannot be taught effectively in other ways. Such a subject as "Logging and Milling" is an example. Photographs of men at work in industry, or photographs taken of pupils in the class who are performing a certain process correctly, are certainly of value in teaching, especially in the creation of interest and incentive. Charts are of value in giving information to pupils such as the sizes of drills for certain sizes of screws, sizes of nails, kinds of joints, etc. An instructor may have any number of these on the wall in the laboratory or on a specially prepared stand. Such charts can often be obtained from various companies free of charge. Very often an effective job of imparting certain forms of information is done by the use of drawings. When the pupils make the drawing and then work by them, the result is more effective. Sometimes, however, it is a good idea to have drawings for reference which have been made by a skilled draftsman. Display boards which have been made by the pupils and instructor, and which bear certain definite information that should be known, are valuable teaching aids. One can mount such things as nails, screws, sandpaper (various sizes and grades), joints, and the like, on boards. Lantern slides which show cross sections of a tree, or the like, are valuable aids in teaching. Dramatizations of correct processes to be learned, of things to be known, and of desirable characteristics to be acquired, are without doubt, indispensable visual aids.

Various Types of Instruction Sheets

There is a large amount of information which the instructor wishes his pupils to learn. Some of this information may be found in one book and some in several books. Sometimes the organization of the book is not the organization which the teacher wishes to follow. Quite often the instructor will reorganize this material on four kinds of sheets. When these sheets are used correctly, the instructor will find them of much value in teaching. These four sheets are:

1. Operation Sheets — which deal with processes or operations to be performed.
2. Information Sheets — which deal with facts or related information to be learned.
3. Assignment Sheets — which make definite assignments for the pupil.
4. Job Sheets — which give the steps in order, that are necessary to do a specific job.

Tests play an important part in the teaching and learning of any subject. An instructor may find out by means of a test to what degree learning has taken place, and a pupil may also have a chance to find out if he has gotten the important information that should be obtained. Tests should be given when the need arises, and should be of two main types. Essay or old-type tests are of value in giving the pupil a chance for expression and organization of certain bits of subject matter. New-type tests may be either true-false, multiple-choice, completion, matching, or standardized. They are valuable because by means of them a large number of learning units may be tested. Standardized tests, which are usually a combination of new-type questions are quite often a basis for comparing one group of pupils with another within the same school or between different schools. An instructor, in making out a test, must take into consideration the subjectiveness and objectiveness of the test. For this reason, it is probably better to have a combination test of both old-type and new-type questions.

A discussion may stimulate pupils to thinking, and at the same time make for clarity in regards to certain information. The instructor may conduct a discussion on the recitation-type basis, or the pupils may discuss certain matters between themselves in groups. Very often much learning takes place in these discussions when the individuals are interested in the material, and when the material itself incites a desire on the part of the pupil to receive it. A good discussion with the instructor at the head will be one that has been well planned and which contains sufficient illustrations as to be meaningful and interesting.

Reports may be of two kinds; namely, those required by the instructor and those which are not required. It is necessary to require some reports on subjects which can best be taught in that way. Extra credit can be given pupils who bring in reports which are not required by the instructor. These reports can also be given either orally or in written form. The related information in woodwork contains many subjects which are excellent for reports.

One can readily see the large amount of information that the pupil comes in contact with when making a project. It is the instructor's duty to see that the pupil recognizes this vast amount of knowledge, as well as its importance on a particular project at school or at home. Projects which involve processes to be performed and knowledge to be taught are of immense value in teaching. Here the instructor should be especially alert to capitalize on the teaching of related information which is needed on a particular project.

Solving of problems is another method of teaching certain types of information which could probably not be taught by any other method. Such problems often are present in the pupil's homework as well as in his schoolwork. This is an opportunity for the instructor to add to the richness of his teaching, since problems are often a way in which a challenge can be issued to the pupil as well as a method of presenting information to be learned.

Published material such as bulletins and pamphlets often contain some very valuable related information. Such material can usually be gotten free of charge from companies and manufacturing establishments, and from state and national governments. Information gotten from them has usually been compiled by experts as a result of some research that has taken place; therefore most of it is authoritative.

Shop Clubs

Two forms of models which are used in teaching are incomplete models and complete models. Incomplete models serve as an educational medium for pointing out details, methods of finishes, etc. A complete set of incomplete or sectional joints are teaching devices. A shelf or two at each end of the room bearing perfectly completed models offer incentive and thus make for a maximum amount of teaching in that respect.

There are a number of clubs which the instructor may sponsor. A society known as an industrial-arts society which has a hard but meaningful ritual challenging the boys, quite often serves as an important way to help the pupil learn, by creating incentive, and by discussing boy interests. Woodcraft clubs can be organized, where boys hike and study certain phenomena related to their subject, or where they make objects which have a definite value in teaching certain kinds of information.

Two kinds of excursion trips may be conducted; namely, those around the school, and those outside the school. These trips are usually informational and helpful. They do a certain kind of teaching that can be done in no other way. Quite often around the school, the pupil comes in contact with things that do have a definite relation to the subject he is taking, but he fails to realize it until they are pointed out to him. Visits to factories help the pupil to realize just what is going on around him, and what processes are used, what jobs are typical. Before taking any excursion trip, the in-

structor should give the pupil a brief outline of the things he wants them to observe. Reports should be made by the pupils after they have returned, either written or orally. Teaching can indeed be enriched by the use of such a teaching aid.

Whenever a notebook can be used, it helps the pupil to organize his work, it is a basis of grading for the instructor, and a number of teaching values can be attained. In these notebooks, the pupils may keep their project plans, notes on lectures, discussions, information obtained on trips, and other related information which may be needed later on in the course.

Mottoes which are "catchy" and meaningful, and which are placed in a convenient and conspicuous place, are often helps in developing certain traits of character which we wish to develop in the boy, but which we have no definite means of doing, other than by mottoes. Every schoolroom should contain certain inspirational mottoes. Mottoes which are reminders to pupils in the proper use of tools or materials, also occupy a place of importance in the teaching of related information.

Library reading done by pupils for the purpose of getting related information on some particular topic is a medium of teaching that the instructor should fully employ. The library is always full of a wealth of information which can be gotten by a little reading on the pupil's part. The instructor should have at hand a number of topics which are to be reported on as a result of reading done by the pupil.

Whenever an effective job of teaching is done, there must be a well-organized program of procedure of instruction. There must be some means always present for capturing the attention and interests of the pupil, in order to do a maximum job of effective teaching. An instructor cannot resort to any one way of teaching the things he wishes to teach, but must frequently resort to a number of different ways. Different units may require different ways of presentation.

The chart presented herewith, shows an analysis of the things a pupil should know when he has finished his woodworking course. Wherever a check mark occurs, this means that the unit to be taught can be done by the corresponding method. This does not mean that it must be taught by that method, however. It is up to the instructor's better judgment as to the way he is going to present his related information, but he can see readily the number of possibilities he has at hand. In any case, however, whatever the procedure may be, it should be presented in such a manner that it is well organized and to the point, and fulfills the purpose for which it was intended.

Enriching Industrial Arts in Grade 7

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A method of increasing the amount of related material in the industrial-arts offering of junior-high-school industrial-arts work.

All too frequently the work in the industrial-arts shops tends toward a major emphasis on the development of skills and productivity while the related information, which is a vital part of general education, becomes a neglected part of the industrial-arts program. To create a program more nearly balanced in manipulative and non-manipulative experiences we have introduced the *industrial-arts related laboratory* to enrich the opportunities offered in the general metal, printing, and woodworking shops. Of the 450 boys participating in industrial-arts work about 190 are 7th graders who devote two 50-minute periods in one shop and one 50-minute period in the laboratory per week, for one third of the school year. This arrangement permits rotating in each of the shop areas every 13 weeks during the first year.

Industrial-Arts Related Laboratory

The industrial-arts related laboratory is conducted in a room adjoining the three shops and is of classroom size with connecting experimental and storage room. It is well lighted and ventilated with ample blackboard and bulletin-board space. There are places for 20 pupils at drawing tables with stools. Two workbenches in the experimental room provide space for experimental and demonstration purposes. Wall spaces are filled with demonstration charts, maps, commercial charts, and exhibit material.

All 11 divisions of 7th-grade pupils, according to the program arrangement, attend one or the other of the three shops during the week and one period in the laboratory.

Content Industrial-Arts Related Laboratory

The course is by no means static as pupils are largely responsible for planning and organizing the topics about which they wish to learn. It is natural that the instructor anticipate the pupil's needs in order to prepare suitable text and experimental material. To conserve time and meet the reading abilities of seventh graders it has become necessary for the instructor to prepare his own informational units; the material is written in story form, mimeographed, and stitched into individual folders. Each unit is closely correlated with the shop area in which the pupil is working and is sufficiently brief to permit, in most instances, completion in one period. Text and reference books are used to supplement the informational units.

Notebooks are a vital part of the program. Samples of printing, paper, vocabulary lists, bills of material, drawings, notes, and other items pertaining to shop activities which increase the interest and educational factors are inserted. Each pupil is required to submit two short essays on some shop topic of his own selection about which he wishes to become better informed.

Course Outline

I. General Metalworking.

1. Orientation and Organization: Explanation of shop correlation, planning topics and experiments, explanation of informational units, explanation of plan and guide sheets.
2. Graphics: Use of instruments, drawing board, tee square, triangles, scale, compass, pencils; layout metalworking-shop project drawing.
3. History of metals: Iron, tin, copper.
4. Development of sheet-metal working tools.
5. Purchase and care of tools: Developing the home workshop.
6. Solder and fluxes.
7. Soldering: Soldering coppers, tinning coppers, heat.
8. Safety.
9. Finishing metals.
10. Mathematics: Gauges and weights of metals, cost of metals.
11. Motion picture, "From Iron Ore to Pig Iron."
12. Motion picture, "Making Sheet Tin."
13. Tests.

II. Printing.

1. Orientation and organization.
2. The story of printing.
3. The California job case.
4. The development of movable type.
5. The story of printing inks.
6. Printing presses.
7. The story of paper.
8. Mathematics: Line measure, pica system, unit measure (point system).
9. Motion picture, "The Printing Industry."
10. Motion picture, "From Tree to Newspaper."
11. Opportunities in the printing and publishing industry.
12. Tests.

III. Woodworking.

1. Orientation and organization.
2. The story of wood and forest regions.
3. Motion picture, "Lumbering."
4. Sketch of project from wood working shop.
5. Tools and their care.
6. Planning the home workshop.
7. Story of fastenings: Brads, screws, glue, common joints.
8. The story of sandpaper.

9. The story of shellac.
10. Mathematics: Bills of materials and supplies, computing board feet and costs.
11. The story of the woodworking lathe.
12. Tests.

Methods of Teaching

It is obvious that a number of techniques are used in conducting classes in the related laboratory. The pupil develops through drawing an appreciation of the value of mechanical drawing as a language which is universal, exact, brief, and easily understood. He develops a certain amount of skill in the use of the common drawing instruments. He learns to read simple drawings through an appreciation of the principles and conventions involved. He becomes critical of his own achievement through an evaluation of his own work compared to that of others. Frequently the exploratory experiences in this new language arouses latent interests which encourage him to continue the study in future classes. His work in drawing is naturally of an individual nature.

The informational units are developed for the purpose of presenting the background, development, manufacture, distribution, and utilization of the materials used by the pupil in the shop. The information increases a knowledge of the source of materials and aids in a more critical way the appreciation of the values of supplies, tools, and equipment of the school and home workshop. Among the most satisfactory methods of carrying on the study of the informational units are:

1. Small groups of pupils working together under the leadership of a chairman who selects a section of the topic which they wish to study and report upon. Another group carries on experimental work. Reports and demonstrations before the class complete the work of the period.
2. Individuals selecting their own topic, preparing a report for the class, stating reasons for their selections, presenting visual material in the form of maps, pictures, or exhibits pertaining to the topic.
3. Socialized discussion taking place after study of the unit or motion picture.

Involved in each of the methods are opportunities for an appreciation of industry and industrial life. In all industry there is a romantic story of discovery and development which dates back through the ages. There is the challenge of industrial investigation as it applies to present experiences; the opportunity of industrial experiences brought about by "manufacturing" materials such as sandpaper, cutting shellac, making paper and printer's ink, solder, and flux.

Correlation With Other Subjects

There is an increasing tendency toward direct correlation with other subjects, not only in the related laboratory but in the shops as well. Meetings with department heads and teachers are encouragingly indicative of further correlative possibilities. Pupils find that mathematical problems which arise in the shop are based on the textbook material of the classroom. Research reports are written for the shops but acceptable in the English class as essays. Shop vocabulary lists are included in the spelling lists of the classroom. The library period and study periods are frequently used to supplement the shop library which is accessible at all times for the purpose of research and written reports. Pupils know that the shop teacher often uses his material for the development of informational units.

Informational Unit

Informational units are mimeographed and stitched into individual pamphlets with suitable cover sheets. Our later units have become more attractive with the addition of illustrative material achieved by the use of the mimeoscope. Sufficient copies are available for use by each pupil in the class.

Visual Aids for the Woodworking Shop

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A résumé of what the instructor of any type of shopwork may do to make his work of teaching more effective.

The writer has always used some type of visual aids in his teaching, but until recently has given little conscious thought to the great help they offer the teacher. A recent study of visual and sensory techniques has caused the writer to do some reflective thinking on the subject, with the result that this article was produced.

The description given includes such phases of visual techniques as the use of wall charts and panels, pictorial material, field trips, still and motion projection, models, how to construct visual devices, and sources of some few materials.

The Use of Objects, Specimens, and Models

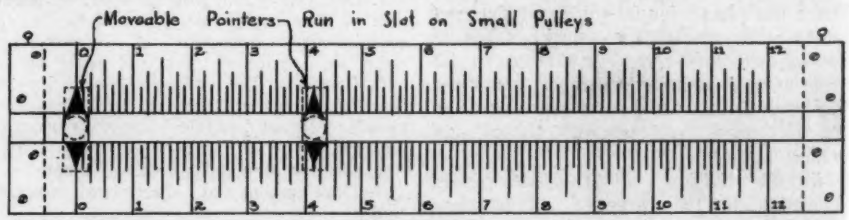
A good device which is helpful for teaching students how to measure accurately and to learn the divisions of the rule is a large-scale model of a rule. The model is equipped with two movable pointers which enables the teaching of any kind of measurements. It should be constructed so that it can be hung in some part of the room that is visible to all student's benches. This device is very helpful in teaching large classes. It allows the student to prove his ability for measuring before the whole class.

It can be cheaply constructed with materials found in any woodshop. A number of advanced students can construct it readily if provided with a plan. It is advisable to use as large a scale for the model as space will allow. The accompanying drawing shows the details of the model as it is used at present.

A device which I have seen advantageously used, is a large-scale model of the ripsaw, and of the crosscut saw. As most teachers realize, the teeth on an actual saw are too small to be seen by the whole class when explaining the size, set, and how the teeth are filed. The models are comparatively easy to make, and, in addition to wall charts (which are available from saw companies), the teacher can explain with greater ease the difference of the two types of saws. It also facilitates understanding on the part of the pupil.

Two large models of a chisel may be constructed to show the correct or hollow grinding, while the other shows the incorrect, convex bevel cutting edge. These aids also make good decorations for the school shop.

A problem which gave me much concern for a long time was to give the pupil a correct impression of what a board foot consisted. The following device is a wonderful help in explaining this important phase of woodwork. It consists of a board 1 in. thick, 12 in. square, and six pieces 1 by 2 by 12 in. with the first block it is possible to establish the proper concept of the unit of one board foot, while with the smaller blocks it is possible to shift them



Large model of a 12 in. rule

around, showing that there are other sizes of lumber which will produce a board foot.

Another idea which has been found helpful is to construct models of some of the smaller exercises, joints, and projects and display them on panels or on shelves, around the shop. If these are well made, they demonstrate to the students the possibilities of good craftsmanship. They also act as guides for self-instruction to at least some of the students.

Wall Charts or Panels

A project for teaching the various kinds of wood, their peculiarities, uses, and how to identify them, consists of samples of the kinds to be studied mounted on a piece of heavy mounting board. There are several ways of doing this so that any teacher may adapt the system for use to his particular condition. They may be grouped according to species, placing a number on each mounting; grouping according to hard and soft woods; or by placing each piece on an individual mount. The latter is probably the best method. If thus mounted, they may be used in the school museum when not in use in the shop, thus giving the entire school access to them. Each mounting should contain the common name and genus of the specimen, together with a brief description of the tree, the locality where it is most generally found, and its uses for commercial purposes. This information is placed on both front and back of the mounting so that the teacher, when giving a description to the class, will have the main information easily at hand. When mounted singly, as described, the samples may also be laid side by side for comparison. Some instructors prefer to have the information pasted on the back of the sample only. It seems preferable to the writer, however, to have the specimens mounted so as to have the information visible to the student at all times. A sample, 2 by 4 in., is usually large enough to serve most purposes. In making the collection, the students should be asked to assist, as they may secure some specimens which the teacher is unable to procure. The students usually take pride in helping to gather such a collection.

Another type of collection of woods which is far more valuable but much more difficult for the average teacher to assemble, is one consisting of a cross section, a longitudinal section, a bark section, the fruit of the tree (if there be such), and a plaster cast of the leaf (colored to match the real leaf), all assembled on a panel. A board such as this with the information about the tree would certainly be valuable, especially for the school museum or the school display cabinets found along the halls in many schools.

To make such a collection will involve frequent trips to the forest. It will require permission from the owner of the property to cut a tree or to trespass on his land to find a tree which has recently fallen to get the specimens desired. Where there are several teachers located in close proximity to each other a cooperative project could be worked out that would allow for the exchanging of specimens between them. A good many samples could be secured from a single cutting if they were kept to a reasonable size. If there are a dozen or more teachers in one county or unit and each one was responsible for one or more species, a collection could soon be built up by each one in the group.

A suggestion for a unique club activity would be for each teacher to organize a club to carry out the making of the display panels. The entire project might be carried out by the students if there were enough interested in conservation, or in forestry. The teacher himself would in all probability get as liberal an education as the students from an activity of this kind. It must be realized that a project such as this would have to be carried on almost entirely in the spare time of the students and of the teacher.

A device which has been of great help to both myself and the students with whom I meet in the shop, is a wall chart containing the sizes of nails, brads, screws, and other types of hardware that the school stocks. It saves both the teacher and the student time when some type of hardware is needed. A separate chart should be prepared for each type, with the name of the material plainly marked or printed on it, the size and gauge or other information should be placed opposite each sample. When a student needs screws, for instance, he need only consult the chart to find the particular kind that is necessary for his work. The same type of chart can be provided for sandpaper and other materials used in the school shop.

Some good examples of this type of chart showing materials and processes can be seen in a visit to institutions such as the Commercial Museum in Philadelphia, Pa. A trip to the museum with the students is often a good practice to develop instruction pertaining to such materials as paint, shellac, and varnish if it is found impossible to construct these charts. These institutions often provide special teachers to teach a lesson on such special topics. If it is found impossible to make the trip to the museum, oftentimes the teacher may borrow, through a loan service conducted by the museum, the materials needed for instruction.

Pictorial Materials

A word about pictures for the school shop. Pictures, of the various types of work that the activity may lead to, provide an excellent background for the work of the student. Naturally pictures pertaining to safety education should be included. Most school shops have such material displayed. The only trouble is that the pictures displayed are very rarely changed. When this is the case, the student soon becomes tired of looking at them and then they accomplish but little. It may be wise to use fewer pictures and to replace them every so often with others. A word calling attention to the new pictures displayed will soon attract the student's attention, if his attention has not already been aroused by the different atmosphere of the room which the new pictures will create. There are many sources of pictures and charts available at little or no cost if they are sought. A good procedure to follow, is to mount the pictures on a thin mounting and to place them in a heavy mounting which will serve as a frame. This will make the matter of changing the pictures a simple task whenever a change is desired. Perhaps a few students will be glad to assist or undertake this work for the teacher either before or after school hours.

Still Projection

There are three types of still projection possible for use in connection with school-shop work. Only mention will be made here of the various types. The use of these will depend on the teacher's personal preference. It is the writer's opinion that since actual demonstration can be much more effective than the mere projection of a picture, still projection, except for guidance work, is of little value to the teacher of shopwork. The glass-slide projection, film-slide or film-strip projection, and the opaque projection are the three types of aids available. If there are subjects that the teacher can profitably cover by the use of these visual aids, a great deal of this type of material is available to him. The teachers may derive much satisfaction out of making a collection of film slides or film strips. This may be done inexpensively and he may even take his own pictures and convert them into slides.

Motion Pictures

One of the most popular of present-day visual aids is the motion picture. It has probably been the most abused type of visual education due to the lack of knowledge of how to use this device effectively. Some states now require that a course on instruction in visual aids be undertaken before permanent certification will be made. It probably should be given as a part of the preparation for teaching rather than after it has begun. It should be borne in mind that this teaching aid is not something to be used merely to prove that one is a modern educator. Too many teachers seem to look upon the movie in the classroom in just that way. The student should be prepared for the showing of a picture. He should be given an explanation of why the picture is going to be shown and of some of the points that will be covered by the presentation. The teacher should know just what the picture contains, therefore, a preview of the picture is necessary to obtain this data. A class discussion about the picture after the showing will, of course, be necessary to insure that the student has obtained from the picture the desired information. Pictures of too great a length

should be avoided. One topic at a time is sufficient or else the students will be confused. Sometimes it will be necessary to show the picture a second time after the discussion has taken place. This, of course, must be left to the judgment of the teacher. Generally pictures sent to the school by outside agencies do not require rewinding, but if the picture belongs to the school's library of pictures they should be returned ready for another teacher to use them.

Such topics as lumbering, manufacturing and curing of lumber, and various other industrial processes too numerous to mention can undoubtedly be best taught by using a motion picture. Also the use of movies for vocational information is of great value. Even if the student does not intend to follow the occupation covered by the picture, the general information he receives from seeing how his fellow beings make their living is of social value to him. There is a wealth of material available for this type of teaching. It will repay the teacher to incorporate some of this into his program.

As to the type of projector to use, this depends on the amount of money that can be expended. Many schools already possess projection equipment so that it will only necessitate making the arrangements to use it. If a machine is to be purchased mainly for classroom work, the sixteen-millimeter machine, because of its portability, will probably answer the purpose better than a larger machine.

The Making of Visual Aids

One suggestion has been made with reference to the making of wood charts. It will be remembered that it was suggested that the students be formed into a club to carry out this project. The work of this club may also be extended to include the mounting, labeling, and filing of pictures, and the making of charts. Wall charts of materials may be constructed. Slides for still projection can be made, and many other activities can be carried out in such a club organization. It will give the student a type of activity which is new, it will add to his education, and at the same time, give him a practical example of what cooperation really means.

Sources of Visual Materials

Some manufacturers of products have charts and exhibits which can be procured with little or no expense. There are only a few listed in the following, but there are many more that the reader can easily obtain. One precaution is necessary, as some school authorities do not sanction the use of materials that have commercial advertising connected with them. It would, therefore, be best to secure the opinion of the school officials before using such materials. This is particularly true of some motion pictures. If it shows a comparison of products, and presents the idea that it is the best to use, it is safer not to employ such materials. The following addresses may be used to obtain some very useful teaching aids:

Stanley Rule and Level Co., Educational Dept., New Britain, Conn.

Henry Disston & Sons, Inc., Tacony, Philadelphia, Pa.

Behr-Manning, Troy, N. Y.

Commercial Museum, Philadelphia, Pa.

United States Dept. of the Interior, Bureau of Mines, Pittsburgh, Pa.

Bibliography of Technical and Industrial Motion Picture Films and Slides, Dept. of Industrial Teacher Training, 80 Center St., New York City, N. Y.

Keystone View Co., Meadville, Pa.

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McClusky, Dean F., *Visual Instruction* (New York: Mancall Publishing Company, 1932).

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Shop Courses

Curriculum for Vocational Education in Secondary Schools

Joseph Krob

J. S. Morton High School, Cicero, Illinois

Safeguarding the future educational possibilities of vocational students.

Too many times we have heard vocational education derided and looked at askance by some of our leading educators and educational institutions. Two of the prevalent reasons seem to be; first, that the vocational student, when graduated, is not prepared to continue his education at college or university; second, the academic teachers as a majority will not admit the importance and need of vocational training.

SCHEDULE OF INDUSTRIAL ARTS & VOCATIONAL COURSES

	First Year		Second Year		Third Year	Fourth Year
AUTO MECHANICS	Auto Theory	Auto Mechanics	Mechanical Drawing	Vocational Trade Drawing	Vocational Auto Mechanics	
BUILDING TRADES	Building Trades Drawing	General Metal	Woodwork	Electric or Auto Theory	Vocational Building Trades	
MECHANICAL DRAFTING	Mechanical Drawing	Pattern Making	Machine Shop	Electric or Auto Theory	Vocational Mechanical Drafting	
ELECTRIC MECHANICS	Electric Theory	Electric Mechanics	Mechanical Drawing	Vocational Trade Drawing	Vocational Electric Mechanics	
MACHINE SHOP PRACTICE	General Metal	Machine Shop	Mechanical Drawing	Vocational Trade Drawing	Vocational Machine Shop	
PATTERN MAKING	Pattern Making	Gen.Metal or Woodwork	Mechanical Drawing	Vocational Trade Drafting	Vocational Pattern Making	
PRINTING	Printing	Elective	Mechanical Drawing	Vocational Trade Drafting	Vocational Printing	
WOODWORK	Woodwork	Pattern Making or Gen.Metal	Mechanical Drawing	Vocational Trade Drafting	Vocational Woodwork	

Vocational Work for Two Years

The first accusation is true in a majority of cases but there is no reason why it cannot be avoided by a well-planned curriculum. It seems rather presumptuous to assume that a student following a trade course could not at the same time be prepared for college and university work. The future always holds this possibility for the student; therefore, he ought to be prepared to avail himself of it. Many a college graduate had no way of knowing during his high-school career that his future would be bettered by a college education. By taking a vocational course in high school he took care of his immediate future and at the same time the school could take care of the unit requirements for college education should the opportunity present itself. The school then, not only graduates a student trained for some useful trade; but one who is prepared for college with a well-rounded education, as well.

After the student is graduated and finds he cannot continue at college the vocational department tries to place him in a job he has been trained for, and the student if he wishes, can continue his education by studying evenings. This placement of students will not prove to be difficult once industry finds out that the school is turning out a fine product.

The curriculum presented here was designed and used by the vocational department of the J. S. Morton High School of Cicero, Ill., where admirable work in the field of vocational education is being done. This school has found it quite possible to train the vocational student for a trade and at the same time prepare him to meet college requirements. The two main requirements to accomplish this end is good guidance and a longer day for the student. The students do not mind spending the additional time for this training, and it is impossible to train all who desire it.

In this schedule eight trade courses are being taught. Each of the vocational courses has three or four industrial-arts courses that are required as prevocational work before the student can enter the vocational-training course. These pre-vocational courses are taken in the first and second years and serve as an orientation for the vocational work to be followed. They also give the student a knowledge of the related work which he will need in his trade. All students are required to take two semesters of drawing. The first semester being mechanical drawing and the second semester vocational trade drawing; that is, drawing related to his particular trade. In the junior and senior years the student follows his trade course three clock hours a day and upon completing this work with the required academic subjects he is graduated.

The shops do not work independently but are a completely integrated system. From the drafting room where the products are designed, the different projects can be traced through all of the eight shops until the finished product is produced.

In the above schedule are presented all the academic subjects necessary to graduate the student for entrance to an engineering college or university.

With this arrangement of courses we have twelve units of work for the first three majors through the four-year period. The North Central Association accepts five units of vocational and industrial work for graduation from high school and for university and college requirements if there are three majors or two majors and two minors. Our English and mathematics gives two majors, and natural science and social science give us the two minors a total of twelve units. If chemistry and a language can be taken in the last two years this gives us an additional two units or a total of fourteen. In either case the student needs only three units or one unit respectively to finish his unit requirements and the vocational work is more than enough to give him this.

This curriculum is possible. It is not fair to the student, and the school is not doing an honest job of education if it does not give the vocationally trained student a well-planned course of study such as this.

There are a few deviations in the requirements for entrance to certain schools and certain engineering courses such as chemical engineering; but these can be taken care of with little difficulty. It is to be hoped that more and more schools offering vocational training will adopt similar courses for the benefit of their students.

SCHEDULE OF ACADEMIC COURSES

	First Year		Second Year		Third Year		Fourth Year	
1.	English IB	English IA	English IIB	English IIA	English IIIB	English IIIA	English IVB	English IVA
2.	General Science	Physiology	Vocations	Civics	Physics IB	Physics IA	American History	American History
3.	Math IB	Math IA	Math IIB	Math IIA	Math IIIB	Math IIIA	Chemistry	Chemistry
4.	← Industrial Work →				← Vocational Work →			
5.					Language if desired		Trigonometry	Elective

A Course in Pre-Vocational English

Della Gervin Freeman

Stair Technical High School, Knoxville, Tennessee

A usable English course for boys in junior high school, and in part-time and full-time vocational schools.

The Aims of Prevocational English

Many students, after having passed through the doors of learning into the turmoil of the business and industrial conditions of today, find themselves inadequately prepared to meet the demands of the modern world. There is a great amount of talk about training for the trades, conducting vocational classes and the like. In an effort to meet these demands and to provide suitable curriculums so that the future graduates of our public schools may know success, the technical school has been born. It is, as yet, an infant but shows great potential strength.

As a teacher in a technical school, one has an entirely different philosophy of education to that held by the average teacher of an academic class. Indeed, one *must* sense the throb of machines and feel the pulse of industry. One *must* interpret the desires and needs of the various occupational workmen. These workmen become individuals with dreams which the school must mold into realities.

The purpose of the technical school is to provide adequate educational advantages for that vast group of pupils who will never enter the professions but who perform that limitless number of tasks in our trades and industries; those same pupils become the workmen of tomorrow.

This purpose must permeate into each classroom. It becomes the basic principle for building each course of study. Academic English is a rigid course set up by authorities with many demands and regulations for meeting *requirements*. A course in prevocational English is a definite approach toward bridging the gap between this traditional curriculum and trade English which prepares for the practical world of work. It is essential for the teacher to bring his visions down from the clouds and to plant his feet firmly upon the ground. It is simple enough to say "prepare for industry" or "provide for the needs of tomorrow." One can give lip service to

such terms and fail. In order to really get results (trade and industry demands a definite product; whether that product be in terms of steel or transportation or *a good workman*) the teacher must have an accurate knowledge of his goal before charting his course of study.

Since prevocational training is new to the general public and since it is so near to the everyday life of the average man; the teacher of prevocational English is repeatedly confronted by such questions as: "What is prevocational English?" or "How is it different from the other English courses?" Such inquiries come from the average citizens, the present and prospective patrons of the schools. The ideas of practical education are even yet bewildering to the traditional concepts of the majority of the professional people. They, too, give voice to their confusions in such manner as: "What do you teach?" and "Who makes your course of study?" After extensive deliberation the following aims are offered as evidence of the departure from the usual English content toward a practical attack upon the problem of providing the graduates of our schools with sufficient potential resources to successfully meet the demands of their future employers. It is a challenge to the dormant initiative and to the intellectual ability of the classroom teacher.

The aims of prevocational English are to:

1. Orient the student to trade conditions.
2. Develop attitudes of good workmanship.
3. Provide vocational guidance.
4. Teach those fundamentals of English and of character education which will help the student to prepare for, enter into, and succeed in his chosen occupation.
5. Give a workable understanding of English so that the student is able to:

a) Acquire a broad vocabulary (practical and technical) suited to his occupational field.

b) Learn the techniques of exact workmanship.

c) Perform simple written duties in his chosen occupation.

d) Utilize printed materials.

A Prevocational English Chart

It is not enough to fluently quote phrases and to automatically recount aims. The next step is that of putting this whole educational philosophy to the acid test of production. The theory is sound — providing it works. To go into the classroom and give those boys and girls what they need is a responsibility that cannot be avoided. Prior to charting the course the teacher must spend unnumbered hours in interviewing prospective students and their parents. To know each student as an individual, to discover his interests and to get a glimpse of his secret ambitions together with an introduction to his abilities paves the way toward a mutual understanding of the ultimate goals for both teacher and pupil.

The following chart has been found to be fundamental in building a course of study to fit the needs of the average technical school. It can easily be adjusted to meet any divergent demands of other localities.

Pre-Vocational English Chart

Ways and Means	*Course Content*
I.	I. Adequate Orientation
A. Group Testing (1, 2, 3)	A. Battery of tests 1. General ability test 2. Vocational Inventory test 3. Achievement test (Written by the teacher of the course)
B. 1. Personal interviews 2. Group discussion 3. Record interpretation	B. Interpretation for individual students 1. Scores on vocational inventory test 2. Values on choosing an occupation 3. Use in placement
C. Self-examination	C. Interest blank
II.	II. Character Education
A. 1. Brief talk on *Character* 2. Reading followed by questions 3. Discussion of character traits 4. Explanation in terms of life situations	A. Inspirational materials 1. Introduction 2. Literature 3. Biographies 4. Poems
B. 1. Contrasts and comparisons 2. Discussion (It is a "selling program" for the teacher) 3. Posters and slogans	B. Practical values 1. Application to everyday life situations 2. Incorporation into own life 3. Rules of habit formation
C. Definitions and examples from familiar experiences (1–10)	C. Character traits 1. Self-knowledge 2. Ambition 3. Industry 4. Perseverance 5. Punctuality 6. Thoroughness 7. Honesty 8. Personal appearance 9. Guarded speech 10. Courage
Ways and Means	*Course Content*
D. Questions and projects	D. Analysis of each character trait
E. 1. Group discussion 2. Reports from business leaders and personnel directors 3.	E. Application to trade and industry 1. Essential to success 2. Reasons for promotions of employees 3. Reasons for discharging employees
III.	III. Vocational Guidance
A. 1. Definition of term 2. Discovery of personal interests and abilities 3. Discussion	A. Introduction to vocational guidance 1. Meaning of vocational guidance 2. Personal help 3. Disclosure of individual responsibilities
B. 1. Study of government bulletins 2. Explanation of changing conditions	B. Employment conditions 1. Local and national 2. Possible trends
C. Projects in occupational analysis (1–10)	C. Job analysis 1. Employment conditions 2. Possible trends 3. Abilities required 4. Preparation necessary 5. Personal satisfaction 6. Possible advancement 7. Working conditions 8. Expected compensation 9. Public opinion (concerning the job) 10. Legislation (enacted and pending)
D. 1. *a*) Interpretation through tests and charts *b*) Counseling	D. Planning your future 1. "Know Thyself" *a*) Interests and abilities *b*) Selection of an occupation

Ways and Means	*Course Content*
2.	2. Entering the occupation
a) Answers to want ads and holding interviews	*a*) How to apply for a job
b) Study of biographies	*b*) Building a reputation
IV. A. B. C. D. E. F. G. Study of simple compositions and forms with written work	IV. Prevocational Grammar A. Simple sentences B. Everyday punctuation C. Frequent abbreviations D. Common capitalizations E. Personal pronouns F. Verb forms G. Written date forms
V. A. 1. Spelling 2. Selection of suitable definitions 3. Oral and written work	V. Vocabulary Growth A. Technical terms 1. Spelling 2. Usable word comprehension 3. Usage
B. 1. Determining the pronunciation, definitions, etc. 2. Using in preparation of occupational reports	B. Dictionary techniques 1. Common uses 2. Value to workman
VI. A. Written and oral work B. Rewriting for best work choice C. Checking details of work	VI. Technical Description A. Description of tools and supplies B. Choice of technical terms C. Accurate observation
VII. A. 1. 2. 3. 4. 5. Written projects B. 1. Reading and explanation for clarity 2. Checking for errors 3. Choosing best terms A. 1. Oral directions 2. Checking for reading comprehension and final results	VII. Occupational Reports A. Type forms 1. Bids 2. Orders 3. Bills 4. Recommendations 5. Complaints B. Essential characteristics 1. Clearness 2. Accuracy 3. Brevity A. Following directions 1. Careful attention 2. Sincere effort

Ways and Means	*Course Content*
VIII. B. 1. Rechecking with directions 2. Preparing detailed work	VIII. Exact Workmanship B. Obeying orders, rules, signs, etc. 1. Exactness 2. Thoroughness
IX. A. 1. Study of good forms 2. Writing detailed information	IX. Business Communications A. Business letters 1. Good form 2. Complete accuracy
B. 1. Study of rules 2. Rewriting for clarity	B. Business telegrams 1. General regulations 2. Clarity of thought
C. 1. 2. 3. Practice in use of telephone	C. Telephone ethics 1. Courtesy 2. Speaking voice 3. Speaking time
D. 1. Comprehensive reading projects 2. Making orders 3. Rechecking	D. Industrial catalogs 1. Reading techniques 2. Application of information 3. Accuracy of details
X. A. 1. Projects for library research 2. Reading books selected for individual interests 3. Selected oral readings	X. Reading Techniques A. Reasons for reading 1. Information 2. Pleasure 3. Entertainment
B. 1. Examination of different papers 2. Comparison of similar news stories	B. Daily papers 1. Types 2. Validity of news
C. 1. Examination of various copies 2. Use in occupational projects	C. Technical magazines 1. Selection for trades 2. Values to workman
D. 1. Use in occupational projects 2. Recreational reading period	D. Choice of books 1. Technical 2. Recreational
E. 1. Discussion 2. Examination and use of card catalog	E. Library ethics 1. Respect for public property 2. Card catalog

Industrial-Arts Woodwork Course

R. C. McNabb

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Since the introduction of manual training into the United States in 1876, quite a number of attempts have been made to prepare adequate courses of study for the subject. And while these have changed a great deal with the changing concepts of the years, basically all of them have dealt with certain skills set up for the student to acquire through shop activity. Each course of study has had its own particular merits and limitations.

In recent years, a large number of our most outstanding educators and educational committees have directed their attention and effort toward developing and enlarging a rapidly growing vocational program; which has consequently shunted much of the best talent away from the industrial-arts phase of shop training. It is perhaps largely due to this factor that little outstanding progress and expansion has been recently noted in industrial arts.

In the course of study herein set forth, the writer endeavors to bring together in a compact whole all those factors which are really pertinent to actual accomplishment on the part of both pupil and instructor in a beginning course in industrial-arts woodworking.

A tabulation of the doing processes and knowing units, with reference to thirty-one different texts.

The doing processes actually essential in a beginning course are logically arranged and are paralleled by certain desirable knowing units of information, and amplified by various references from some of the

Grouping of Projects

	Name of Project	References on the doing processes. Key: #23/39 means p. 39 in book No. 23 in the bibliography appearing in this article.		
Group 1	1. Chiseling board	#23/39		
	2. Cutting board	#2 /106	#17/136	
	3. Bread board	#19/84	#23/31	#30/9
	4. Swing board		#23/24	
	5. Solitaire board	#4 /262	#27/11	#30/11
Group 2	1. Nail box	#2 /106	#17/149	#24/14
	2. Knife and fork Box	#17/151	#24/16	#25/162
	3. Whisk broom holder	#27/5		
	4. Stationery box	#27/6		
	5. Knife polishing box	#17/150	#24/15	
Group 3	1. Match box	#19/83	#25/26	
	2. Bracket shelf		#25/62	
	3. Broom holder	#17/153	#24/18	#25/46
	4. Sling shot handle			#28/32
	5. Coat hanger	#17/148	#24/13	#25/42
Group 4	1. Book rack		#24/28	
	2. Necktie rack	#17/164	#24/29	#25/30
	3. Sleeve board	#2 /114	#24/9	
	4. Wall shelf	#17/168	#24/33	
	5. Taboret	#4 /259	#17/170	#24/35

	Name of Project	References on the doing processes. Key: #23/39 means p. 39 in book No. 23 in the bibliography appearing in this article.		
Group 5	1. Dog house		#26/6	#28/54
	2. Bird house	#17/152	#25/178	#30/27
	3. Flower box	#2 /98	#25/122	#26/1
	4. Shoe shining cabinet	#25/202	#26/23	#30/36
	5. Book shelves		#26/16	
Group 6	1. Flower pot stand		#27/2	#30/14
	2. Candle holder	#25/167	#30/32	
	3. Jumping standards	#2 /122	#28/4	#31/95
	4. Stilts			#31/35
	5. Hall tree	#2 /134	#30/44	#31/135
Group 7	1. Waste basket	#4/257		
	2. Magazine rack	#11/119	#19/82	
	3. End table	#11/124		#31/163
	4. Medicine cabinet	#2 /116	#25/270	
	5. Cedar chest		#25/274	#31/165
Group 8	1. Foot stool	#17/166	#17/192	#29/5
	2. Bookcase			#31/171
	3. Library table			#31/169
	4. Writing desk		#25/278	#30/52
	5. Telephone stand & stool	#25/266	#30/48	#31/155

most used authorities on these necessary processes or operations. Not only are the knowing units tabulated, but they are numbered to parallel the doing processes wherein their possession will act as a material asset to the individual. Furthermore, several references are given to amplify and simplify, for both the instructor and the pupil, each of these doing processes. In most instances, specific instructions, illustrations, and directions are found in these references for actually performing the operation named. In other words, they are inclusive enough to cover the process thoroughly from all angles, and are also of sufficient variety to permit access to at least one by practically every student and instructor regardless of how limited library facilities may be.

Not only are pertinent, worth-while references given on the doing processes; but they are listed for the knowing units as well. In both cases, the references are tabulated separately for each doing process and each knowing unit by: author, book, and page; so that a minimum of time and effort may be spent in securing needed information on any particular doing unit or informative fact.

The lists of doing and knowing units outlined in *Standards of Attainment in Industrial Arts Teaching*, compiled and prepared by the American Vocational Association, 1934, have been supplemented, reworded, and rearranged to make up the lists used in this course of study.

In accordance with the accepted industrial-arts procedure, projects are employed to give a basis for developing a command of the necessary skill processes, and to stimulate a further acquisition of the supplemental knowledges that are essential to the fullest individual attainment. Instead, however, of a list of eight or ten standard jobs — a graduated list of eight groups or blocks has been worked out. The processes and requirements of each group are as nearly the same as possible — with the difficulty and complexity of the operations gradually increasing from group to group as the student advances in his work.

In the project-groups column, it will be noted that only those rows are checked where the corresponding doing process is involved in that particular project group. It is best, ordinarily, that only such designs be selected for any project within a group which involve those processes checked in its particular column. The instructor must necessarily exercise judgment here, due to the great variety of designs available and possible for any project named. For this reason one or more references have been listed for each project in each group to act as a guide for both instructor and student. These references contain drawings and specifications for making that particular project. Initiative and superior ability in certain students may justify a slight variation in certain details from time to time.

In the knowing-units column it will be seen that certain knowing units which have a functional bearing upon the corresponding doing units are listed by number to parallel that doing unit. It is well, at this point, for the pupil to consult one or more of the references given (or if perchance none of these should be available, some other that the instructor may suggest).

The reference citations are all listed in virtually the same manner. The key to their use would, therefore, be the same in all cases. The various books which make up the reference list are recorded by numbers, from No. 1 to No. 31 inclusive, and any number within this range refers to the book so listed numerically on that page. For example; in doing unit *18* (to plane end grain), No. 3 designates the third reference in the list (Hjorth, *Principles of Woodworking*); and *71* refers to the page in that book which starts the discussion on planing end grain. Similarly, in knowing unit *11* (shrinkage of wood), No. 3 refers to the same book; and *237* tells us that a description of wood shrinkage is to be found on that particular page.

Bibliography

In the tabulation of doing processes and knowing units which follow, reference by number are made to the books contained in this list.

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10. Use instructions given by manufacturer.
11. Fryklund, V. C. and LaBerge, A. J., *General Shop Woodworking* (Bloomington, Ill.: McKnight and McKnight Publishers, 1936).
12. Klenke, William W., *Joints and How they are Made* (Peoria, Ill.: Manual Arts Press, 1925).
13. Stanley Rule and Level Co., *How to Work with Tools and Wood* (New Britain, Conn.: Stanley Rule and Level Co., 1927).
14. Hjorth, Herman, *Machine Woodworking* (Milwaukee: Bruce Publishing Co., 1937).
15. McGee, R. A. and Brown, Arthur C., *Instructional Units in Wood Finishing* (Milwaukee: Bruce Publishing Co., 1929).

(Continued on page 114)

Tabulation of Doing Processes

Doing Processes	Project Groups: Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Knowing units involved. See tabulation of Knowing units			References on the doing processes. Key: #1 } means p. 173 } 173 in book No.1 in the bibliography appearing in this article.				
1. Read a working drawing.	*	*	*	*	*	*	*	*	15	59		#1 173	#3 250	#8 4	#11 81	#19 8
2. Make out a bill of material.	*	*	*	*	*	*	*	*	13 41	15	36		#8 10	#9 21	#11 85	#18 23
3. Plan an orderly procedure in doing any job.	*	*	*	*	*	*	*	*	9 71	50	53		#11 80	#18 23	#18 95	#19 38
4. Check materials when received.	*	*	*	*	*	*	*	*	9 16	13 60	15				#18 23	#19 38
5. Measure and divide spaces with a rule.	*	*	*	*	*	*	*	*	15			#3 2	#8 17	#9 23	#11 9	#18 27
6. Lay out pattern on stock.			*	*	*			*	15	50	68		#8 97	#18 43	#19 60	#20 45
7. Check lay out of pattern.			*	*	*			*	15	50	68		#8 101			#20 45
8. Lay out curves with dividers or compass.			*	*	*			*	15	50	53	#1 18		#9 29	#11 19	#20 42
9. Divide spaces with dividers.	*	*	*			*	*		15	50	53	#1 18			#11 19	
10. Gage with marking gage.	*			*	*	*	*	*	15	50	53	#1 15	#3 7	#8 29	#9 26	#11 10
11. Gage with a pencil.			*	*		*	*	*	15			#1 17		#8 31	#9 28	#13 26
12. Lay out square cuts with the try-square.	*	*	*	*	*	*	*	*	15	50	53			#8 24	#9 25	#20 28
13. Test squareness with the try-	*	*	*	*	*	*	*	*	50	53		#1 12	#8 79	#9 73	#13 40	#20 26
14. Adjust a smooth or a jack plane	*	*	*	*	*	*	*	*	50 53	51	52			#8 52	#9 51	#11 11
15. Adjust a block plane.					*		*	*	50	51	52	#1 34	#5 77	#8 52		#18 36
16. Plane a surface true.	*	*	*	*	*	*	*	*	2 51	12 52	50 53		#8 66	#9 54	#11 13	#20 33
17. Plane an edge square with an adjoining face.	*	*	*	*	*	*	*	*	2 52	50 53	51	#3 72	#8 71	#9 59	#11 13	#20 34
18. Plane end grain.	*	*	*	*	*	*	*	*	2 52	50 53	51	#3 71	#8 76	#9 62	#13 44	#18 36
19. Proper procedure in squaring up a board.	*	*	*	*	*	*	*	*	50	53		#3 70	#5 72	#9 71	#11 13	#18 39
20. Saw to a line with a cross-cut or rip-saw.					*	*	*	*	2	50	53		#8 33	#9 39		#18 31
21. Use a back-saw.	*	*	*	*	*	*	*	*	2	50	53	#1 24	#8 36	#9 43		#18 59
22. Drive and draw nails.		*	*	*	*	*	*	*	2 53	33	50	#6 54	#8 152	#9 185	#11 31	#18 57
23. Set a nail or brad.		*	*	*	*	*	*	*	33 53	37	50		#8 152	#9 187	#11 32	#18 57
24. Saw inside and outside curves coping-saw.		*	*	*	*		*	*	2	50	53		#8 103	#9 46	#11 39	#18 44
25. Cut curves with compass-saw.			*	*	*		*	*	2	50	53		#8 105	#9 47	#11 41	#18 44
26. Cut curves with turning-saw.			*	*			*	*	2	50	53	#1 26	#8 105	#9 45	#11 40	#18 44
27. Finish outside curves.		*	*	*			*	*	2 50	45 53	47		#8 108	#9 85		#18 45
28. Finish inside curves.			*	*	*		*	*	2 50	45 53	47		#8 108	#9 86		#18 45
29. Drill holes in wood.		*	*	*	*	*	*	*	2 54	50	53	#1 50	#8 123	#9 101	#11 30	
30. Countersink holes.			*	*	*	*	*	*	2 53	39	50	#3 19	#8 158	#9 102	#11 35	

Doing Processes	Project Groups: Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Knowing units involved. See tabulation of Knowing units			References on the doing processes. Key: #1 } means p. 173 } 173 in book No. 1 in the bibliography appearing in this article.				
31. Bore holes with an auger bit.	*		*		*	*	*	*	2 53	50 54	51	#2 154	#8 120	#9 95	#13 51	#18 49
32. Bore holes to depth.								*	2	50	53	#1 52	#3 20	#9 98	#11 29	
33. Use brad-awl to make holes for screws or nails			*	*	*			*	2	51	53	#3 19	#6 54	#8 124	#9 101	
34. Smooth a surface with sandpaper.	*	*	*	*	*	*	*	*	2	44	45	#6 212	#8 91	#9 209	#11 45	
35. Smooth a surface with a scraper.	*	*	*	*	*	*	*	*	2 53	50	51		#8 84	#9 66	#11 44	
36. Round edges with plane and sandpaper.	*		*	*					2 53	45	50	#3 112	#8 108			
37. Round or form work with a spokeshave.				*	*				2 53	50	51		#8 112	#9 65	#11 42	#20 81
38. Lay out and cut a bevel.					*				2 51	15 53	50		#8 74	#9 61	#11 25	#18 41
39. Test bevel cuts with a sliding T-bevel.					*				50	53		#1 13	#8 74		#11 26	#19 49
40. Lay out and cut a chamfer.	*			*	*	*	*	*	2 51	15 53	50	#3 182	#8 80	#9 61	#11 23	#18 41
41. Fasten with screws.			*	*		*	*		2 50	38 53	39	#3 130	#8 156	#9 189	#11 33	#18 53
42. Trim or pare with a chisel.					*	*	*	*	2	51	52	#5 55	#8 108	#9 83	#11 36	#18 61
43. Use a gouge for gouge work.		*	*						2 53	51	52		#9 90	#11 37	#13 148	#18 62
44. Lay out angles from a framing square.				*	*	*			15	18	53		#8 28	#9 34		#21 165
45. Lay out irregular designs by use of squares.	*	*	*	*			*	*	15	50	53		#8 101	#9 33	#11 22	#18 43
46. Lay out duplicate parts.		*	*	*	*	*	*	*	15	50	53	#1 70	#6 153	#9 35	#11 23	
47. Use templates.							*	*	15	53		#6 303	#8 97	#9 33		
48. Smooth curves, ends, edges with rasp-file.		*	*	*			*	*	2	50	53		#8 114		#13 174	#20 51
49. Clean a rasp or file.		*	*	*			*	*	53			#3 62	#8 115	#9 17		
50. Set and use an expansive bit.			*		*				2 53	15	50	#3 19		#9 97		
51. Use a forstner bit.	*					*			2	53		#3 19	#6 63	#9 96		
52. Make a butt joint.		*	*	*	*				2	50	51	#7 175	#8 148	#11 59	#12 60	#18 63
53. Make a half-lap joint.					*		*		2 51	15 52	50 53	#3 90	#8 176	#9 119	#12 50	
54. Lay out and cut a cross-lap joint.					*		*		2 51	15 52	50 53	#3 91	#8 177	#9 126	#18 66	#20 18
55. Lay out and cut a dado joint.							*	*	2	15	50	#3 79	#6 155	#8 188	#9 110	#18 67
56. Lay out and cut a mitre joint.							*	*	2 51	15 52	50 53	#3 110	#8 167	#9 141	#12 39	#13 112
57. Make a dowel joint.								*	15	50	53	#3 85	#6 183	#9 131	#12 34	#18 71
58. Use a doweling jig.								*	15	50	53	#2 156	#3 89	#9 134	#13 108	
59. Use handscrews and clamps.				*		*	*		8	29	31	#6 281	#8 127		#11 60	#18 77
60. Make edge-to-edge glue joint.				*		*	*		8 29	27 31	28		#6 158	#9 134	#12 37	

Tabulation of Doing Processes (CONTINUED)

Doing Processes	Project Groups 1	2	3	4	5	6	7	8	Knowing units involved. See tabulation of Knowing units			References on the doing processes. Key: #1 } means p. 173 } 173 in book No. 1 in the bibliography appearing in this article.				
61. Prepare glue.					*		*	*	27	28	29	#3 119	#8 135	#9 169		#18 79
62. Glue up work.					*		*	*	29	30	31	#3 119	#8 142	#9 171		#13 134
63. Make a spline mitre joint.							*	*	15	50	53	#5 181	#6 180		#12 41	#18 65
64. Cut a groove or a rabbet.							*	*	15 53	50	51	#3 79	#6 294	#8 186	#9 105	
65. Lay out and cut tapers.						*		*	2	15	50	#3 76	#6 263		#9 78	
66. Sharpen a scraper.				*	*	*	*	*	51 75	53	74	#3 58	#8 85	#9 12	#11 44	#18 89
67. Sharpen edge tools.				*	*	*	*	*	51 75	52	74	#3 54	#8 56	#8 61	#9 8	#11 17
68. Lay out and cut blind mortise-tenon joint.								*	2 51	15 53	50	#3 94	#6 166	#8 202	#9 151	#18 69
69. Lay out and cut slip mortise-							*	*	2 51	15 53	50	#3 98	#8 207	#9 162		
70. Lay out and cut haunched mortise-tenon j'nt							*	*	2 51	15 52	50 53	#3 97	#8 207	#9 160		
71. Construct a panel.							*	*	2 51	15 52	50 53	#3 109	#6 292	#9 164		
72. Put on ball catches.							*	*	15	50	53	#3 136		#9 203		
73. Fasten with lag screws or bolts					*				15	50	53		#9 136	#9 192		#18 53
74. Make and fit a drawer.								*	15 57	50 73	53	#3 107	#6 288	#9 115	#11 69	
75. Put on drawer pulls.								*	15 62	50 68	53	#3 138		#9 204		
76. Make a drawer slide.								*	15 64	50	53	#3 108	#6 287		#11 68	
77. Make and fit a door.					*		*	*	2 53	15 68	50	#3 132	#6 295	#8 210		#13 165
78. Cut gains for hinges.					*		*	*	2 51	15 53	50	#3 134	#8 196	#9 197		
79. Fit and attach hinges.					*		*	*	2 53	15 55	39 68	#3 131	#9 194	#11 71	#13 165	#18 85
80. Fasten on a table top.								*	2 53	15 62	50	#3 131	#9 204	#11 64		#18 74
81. Lay out a hexagon.				*			*		15 62	50	53		#8 98	#9 32	#11 21	
82. Lay out an octagon.	*			*			*		15 62	50	53	#3 4	#6 26	#8 99	#9 32	#11 21
83. Lay out an ellipse.							*		15 68	62	67	#1 179		#8 100	#9 30	#11 21
84. Apply inlay.							*		15 67	50 68	53	#3 167	#6 215			
85. Transfer a design.							*		15	68	78	#3 193			#11 20	#15 82
86. Patch a wood surface.					*		*	*	2 29	11 50	15 53		#6 271			
87. Patch a varnish surface.				*	*	*	*	*	19 26	21	22	#1 162	#6 250			
88. Cut an edge mold.							*	*	2 53	50 62	51 68	#3 187	#6 229		#11 67	
89. Make straight cuts on glass.							*	*	15	50	53	#2 60	#6 55			
90. Sharpen auger bits.	*		*		*	*	*	*	51	52		#3 61	#6 62	#8 118	#9 16	
91. Sharpen a saw.					*	*	*	*	51	52		#3 54	#8 40	#9 3	#13 96	#18 115
92. Do upholstering involving simple padding.								*	50 68	53	62	#2 69	#3 196	#6 306		#18 113
93. Do upholstering with webbing & rolled edges.								*	50 68	53	62	#2 69	#3 197	#6 308		
94. Use knife for accurate marking.				*		*	*	*	15	50	53				#11 10	#18 24
95. Dress a screwdriver.			*	*		*	*		53	74	75				#13 93	#18 54
96. Fill imperfections with stick shellac.				*		*	*	*	22	26	78				#15 22	
97. Do fiber seat weaving.								*	50 68	62 69	63	#3 204	#6 314			
98. Put on locks.							*	*	15 66	50	53	#3 134	#6 298	#8 215	#9 200	#13 168
99. Keep tools free from rust.	*	*	*	*	*	*	*	*	53							#20 87
100. Apply stain.		*	*	*	*	*	*	*	1 22	8 26	19 69	#3 214	#6 244	#9 212	#15 9	#18 97
101. Give a fumed oak finish.							*	*	1 69	19	22	#1 157	#3 214	#6 245		
102. Clean and care for stain brushes.		*	*	*	*	*	*	*	26					#9 223	#15 14	#18 111
103. Apply shellac.		*	*	*	*	*	*	*	1 22	19 24	21 25	#3 216	#6 247	#9 216	#15 22	#18 104
104. Clean and care for shellac brushes.		*	*	*	*	*	*	*	26			#1 151		#9 223	#15 25	#18 111
105. Apply filler.				*	*	*	*	*	1 25	22	24	#3 215	#6 243	#9 213	#15 16	#18 102
106. Apply varnish.				*	*	*	*	*	19 25	22	24	#3 217	#6 249	#9 220	#15 29	#18 106
107. Clean and care for varnish brushes.				*	*	*	*	*	26					#9 223	#15 34	
108. Rub down finishes.				*	*	*	*	*	45	47	48		#9 210	#13 158	#15 40	#18 95
109. Apply lacquer.							*	*	19 25	22	24	#3 216	#9 218	#11 77	#15 36	#18 108
110. Clean and care for lacquer brushes.							*	*	26				#9 223			#18 111
111. Apply wax.				*	*	*	*	*	19 69	21	22	#3 218	#6 246	#9 216		
112. Apply enamel.				*	*	*	*		19 69	21 78	22				#13 153	#15 63
113. Clean and care for enamel brushes.				*	*	*	*		26			#1 151		#9 223		#15 63
114. Apply paint with brush.				*	*	*	*		19 69	21 78	22	#3 220	#6 251	#7 237	#9 221	#13 151
115. Clean and care for paint brushes.				*	*	*	*		26					#9 223		#15 61
116. Apply finish with a spray gun.							*	*	23 69	26	53				#10 all	#18 107
117. Clean and care for a spray gun.							*	*	23	26	53				#10 all	#18 108
118. Practice economy of time and materials.	*	*	*	*	*	*	*	*	2 72	50	60				#11 101	#22 57

Tabulation of Knowing Units

Knowing Units	Project Groups 1	2	3	4	5	6	7	8	References on knowing units. Key: #2 } 40 means p.40 in book No. 2 in the bibliography appearing in this article.			
1. Chief characteristics of the common woods.	*	*	*	*	*	*	*	*	#2 40	#7 17		#18 14
2. General working qualities of the common woods.	*	*	*	*	*	*	*	*	#2 40		#18 15	#22 27
3. Some principal uses of the common woods.	*	*	*	*	*	*	*	*	#2 41		#18 13	#22 28
4. Habitat of the common woods.	*	*	*	*	*	*	*	*		#7 17	#11 101	#22 28
5. General classification of woods.					*	*	*	*	#3 223	#6 11		#21 159
6. Usual methods of cutting and milling lumber.		*	*	*	*	*	*	*	#3 230	#7 38	#11 87	
7. Moisture content of lumber.				*	*	*	*	*	#3 236	#7 204	#11 104	
8. The effect of moisture on lumber.	*	*	*	*	*	*	*	*			#11 104	#19 37
9. How to order and check lumber.				*	*	*	*	*		#7 94	#11 85	#19 36
10. How lumber is seasoned.		*	*	*	*	*	*	*	#3 233	#7 202	#11 99	#22 49
11. Shrinkage of wood.					*	*	*	*	#3 237	#7 195		#21 161
12. How to test for warp or wind in a board.				*	*	*	*	*	#5 113	#6 255	#9 56	
13. Standard dimensions and classification of lumber.					*	*	*	*	#3 239	#7 73		#18 11
14. Manufacture and use of plywoods and veneers.							*	*	#3 243	#6 275	#7 177	
15. Mathematics of measurement and its devices.	*	*	*	*	*	*	*	*	#2 17	#3 2	#8 23	#9 21
16. How to calculate board measure.	*	*	*	*	*	*	*	*	#3 240		#11 84	#19 36
17. Use of board measure table of framing square.							*	*	#3 5			#21 180
18. Use of rafter table on framing square.						*	*		#3 5			#21 182
19. The purpose of finishes and finishing.	*	*	*	*	*	*	*	*	#2 53	#3 213		
20. Commonly used finishes.	*	*	*	*	*	*	*	*	#3 212		#11 107	#18 95
21. Comparative durability of finishes.		*	*	*	*	*	*	*	#3 219			#18 99
22. Advantages and disadvantages of the finishes.	*	*	*	*	*	*	*	*	#3 219			#18 99
23. Materials used in finishes.		*	*	*	*	*	*	*	#2 53	#5 209	#6 244	#18 99
24. Source of finishing ingredients.		*	*	*	*	*	*	*	#5 214		#18 103	#22 137
25. Preparation or manufacture of finishes.		*	*	*	*	*	*	*	#2 53	#5 209	#18 103	#22 136
26. Solvents for different finishes.		*	*	*	*	*	*	*		#9 224		
27. Kinds of glue.							*	*	#9 171	#11 92	#14 284	#18 79
28. Preparation of glue.							*	*	#2 48	#3 119	#8 142	#9 169
29. Conditions and requirements of glue in use.							*	*		#3 119		#9 171
30. Action of glue in holding two pieces together.							*	*	#2 47			#18 79
31. Pressure judgement in glue-clamping.							*	*		#8 144		#18 81
32. Kinds of nails.		*	*	*	*	*	*	*	#2 42	#8 149		#18 55
33. Uses of the different kinds of nails.		*	*	*	*	*	*	*		#8 149		#18 55
34. Sizes of nails.		*	*	*	*	*	*	*	#2 43	#8 149	#9 184	#11 89
35. Manufacture of nails.		*	*	*	*	*	*	*		#5 123	#9 183	#11 88
36. How nails are sold.		*	*	*	*	*	*	*			#11 88	#19 63
37. Sizes of brads and how they are sold.		*	*	*		*	*				#9 184	#19 63
38. Kinds of screws.			*	*	*	*	*	*			#9 188	#18 51
39. Uses of the different kinds of screws.			*	*	*	*	*	*				#19 54

Knowing Units	Project Groups 1	2	3	4	5	6	7	8	References on knowing units. Key: #2 } 40 means p. 40 in book No. 2 in the bibliography appearing in this article.			
40. How sizes and kinds of screws are indicated.			*	*	*	*	*	*	#2 44	#8 156	#9 188	#18 52
41. How screws are sold.			*	*	*	*	*	*			#18 52	#19 55
42. How to plug screw holes.							*	*		#8 159	#9 191	
43. Sizes, kinds and uses of corrugated fasteners.		*		*	*				#5 125	#8 150		#18 56
44. Kinds of sandpaper.					*	*	*	*		#8 91	#11 93	
45. Grades and uses of sandpaper.	*	*	*	*	*	*	*	*	#2 52			#18 91
46. Manufacture of sandpaper.		*	*	*	*	*	*	*			#11 93	
47. Grades and uses of steel wool.						*	*	*				#18 92
48. How to use pumice stone in rubbing finishes.						*	*	*				#18 92
49. Classification of the hand woodworking tools.	*	*	*	*	*	*	*	*	#1 9	#2 3		
50. Types of tools and their correct use.	*	*	*	*	*	*	*	*				#19 38
51. How to sharpen tools.	*	*	*	*	*	*	*	*		#13 81	#20 95	#21 192
52. How to test tools for sharpness.	*	*	*	*	*	*	*	*			#20 92	#21 194
53. Proper care of tools in use and not in use.	*	*	*	*	*	*	*	*			#20 87	
54. How auger bit and drill bit sizes are indicated.	*		*		*	*	*	*	#2 20	#3 18		#18 47
55. Types of hinges and their use.					*		*	*	#2 49	#3 131	#9 194	#11 115
56. Types of latches or catches and where used.					*		*	*		#3 136	#9 203	#18 84
57. Types of locks and where used.							*	*	#2 50	#3 135	#8 215	#9 198
58. Types and uses of angle irons and braces.					*	*	*	*	#2 51		#8 173	#18 84
59. Alphabet of lines used in drawings.	*	*	*	*	*	*	*	*	#2 75	#3 250	#11 81	#18 21
60. How to check and inventory supplies & Materials					*	*	*	*			#11 85	#19 36
61. Characteristics of various types period furniture							*	*			#16 all	#17 41
62. Design that is adapted to its intended use.	*	*	*	*	*	*	*	*			#16 236	#17 49
63. Design that is structurally good.					*	*	*	*		#6 260		#17 46
64. Ways to determine if furniture is well made.						*	*	*				#17 45
65. Good proportion in structural units of furniture.							*	*		#11 113	#16 15	
66. Furniture with an appearance of stability.						*	*	*		#11 112		
67. Good proportion in furniture as a whole.						*	*	*		#11 113	#16 15	
68. Pleasing furniture outlines.						*	*	*		#16 9	#16 15	#17 50
69. Appropriate finishes for furniture.					*	*	*	*			#15 103	
70. Acquaintance with terms associated with wood.	*	*	*	*	*	*	*	*	#3 223	#11 85	#18 13	
71. Something of the division of labor in industry.							*	*		#11 110		
72. Automatic machinery in furniture manufacture.						*	*	*			#14 all	
73. Types of joints, where used and why.		*	*	*	*	*	*	*		#7 175		#12 all
74. Kinds of grinding and sharpening stones.	*	*	*	*	*	*	*	*		#8 56	#9 9	#11 94
75. Grades & uses of grinding & sharpening stones.	*	*	*	*	*	*	*	*		#8 56	#9 9	#11 94
76. Opportunities & requirements in carpentry.					*	*					#9 vi	#11 110
77. Opportunities & requirements in cabinet making.							*	*			#9 vi	#11 110
78. Mixing and matching colors.				*	*	*	*					#15 48

(Continued from page 110)

16. Gottshall, Franklin H., *How to Design Period Furniture* (Milwaukee: Bruce Publishing Co., 1937).
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18. Douglas, J. H. and Roberts, R. H., *Instruction and Information Units for Hand Woodworking* (Wichita, Kans.: McCormick-Mathers Co., 1936).
19. Shultz, Leo C. and Shultz, Louis J., *School and Home Shopwork* (Atlanta, Ga.: Allyn and Bacon, 1935).
20. Roberts, William E., *Beginning Woodwork Units* (Peoria, Ill.: Manual Arts Press, 1934).
21. Brace, George M. and Mayne, D. D., *Farm Shopwork* (Chicago: American Book Co., 1915).
22. King, Charles A., *Elements of Woodwork and Construction* (Chicago: American Book Co., 1911).
23. Van Deusen, Clinton S., *Beginning Woodwork* (Peoria, Ill.: Manual Arts Press, 1916).
24. Griffith, Ira S., *Projects for Beginning Woodwork and Mechanical Drawing* (Peoria, Ill.: Manual Arts Press, 1919).
25. Burton, Myron G., *Shop Projects Based on Community Problems* (Atlanta, Ga.: Ginn and Co., 1915).
26. Blackburn, Samuel A., *Problems in Farm Woodwork* (Peoria, Ill.: Manual Arts Press, 1915).
27. Murray, M. W., *Problems in Woodworking* (Peoria, Ill.: Manual Arts Press, 1915).
28. Blackburn, Samuel A., *Boy Activity Projects* (Peoria, Ill.: Manual Arts Press, 1918).
29. Griffith, Ira S., *Furniture Making: Advance Projects in Woodwork* (Peoria, Ill.: Manual Arts Press, 1919).
30. Worst, Edward F., *Problems in Woodwork* (Milwaukee: Bruce Publishing Co., 1922).
31. DeVette, William A., *100 Problems in Woodwork* (Milwaukee: Bruce Publishing Co., 1927).

Advance Hand Composition

M. R. Stewart

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Prerequisites: Parts I and II (For outline see page 135, March, 1939, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION).

An outline of instruction that may be of assistance to teachers of printing on both the industrial-arts and the vocational level.

Part III

1. *Various styles of display:* Centered style, rule-twisting style, fancy type style, panel style, squared style, natural style, modernistic style.

2. *The principles of typographic display:* Balance of mass, shape, color, and vista; harmony of shape, tone, and color; contrast of mass, shape, position, and color; proportion of areas, panels, and color; action of interest and feeling; lines of flow, direction, and position.

3. *Design of effective display:* The value and use of contrast, contrast desirable in type sizes, contrast in length of lines, spacing between lines and groups, varying the white areas.

4. *The approach to, and setting display:* Making a rough sketch, breakup of ads and jobs into several display groups, position for cuts, heads and important part of the design.

5. *Hints on setting display:* The purpose of display, the appeal to beauty; avoid overdisplay, avoid even spacing; make things plain, arrangement of display; make your display forceful, correct use of borders, use of illustrations, setting of signatures.

6. *How to set display heads:* Magazine, newspaper, advertising.

7. *Appropriateness in advertising display:* The psychology of advertising, select readable type.

8. *How to use borders correctly:* Plain, ornamental, and strip borders and their use; purpose of borders; how to choose the proper border; size of border, in harmony with the subject and type; unusual border treatment; raised or shadow panels.

9. *How to use initials and borders:* Ornamental, plain, illustrative; subject harmony; shape harmony; tone harmony; white space; short paragraphs; capitalize by sense.

10. *Tone harmony and contrast:* Combining of bold- and light-face types, choice of border.

11. *Harmony:* General typographic treatment, harmony of different decorative material, harmony of type and illustrations.

12. *Proportion:* Correct proportions of type page and paper page, golden oblong, printers' oblong, hypotenuse oblong, regular oblong.

13. *Balance:* Perpendicular, horizontal, off-center balance, cut balance.

14. Set a professional card.
15. Set a business card.
16. Set an envelope corner card.
17. Set a return envelope.
18. Set a magazine envelope.
19. Set a menu.
20. Set a ticket.
21. Set a reserved-seat ticket.
22. Set a receipt.
23. Set a receipt with stub.
24. Set a statement.
25. Set a billhead.
26. Set an invoice.
27. Set a check imprint, three up.
28. Set a counter check.
29. Set a bank check with stub.
30. Set a voucher check.
31. Set a note.
32. Set a bank draft.
33. Set a deposit slip.
34. Set an interest statement.
35. Set a professional letterhead.
36. Set a personal letterhead.
37. Set a business letterhead.
38. Set a handbill.
39. Set a poster.
40. Set a shipping tag.
41. Set a package label.
42. Set a form with horizontal rule.
43. Set a form with down rule.
44. Set a form with horizontal leaders and down rule.
45. Set a form with horizontal and down rule.
46. Set a wedding invitation.
47. Set a business announcement.
48. Set a church announcement.
49. Set a cover page.
50. Set a title page.
51. Set a four-page program combining cover page and menu.
52. Set a dance program, four pages.
53. Set a church program.
54. Set a blotter.
55. Set a blotter, break down for two colors.

Tabular Composition

56. Set type form, with horizontal rule.
57. Set type form, rule in type form.
58. Set type form, with vertical rule.
59. Set blank form with horizontal and vertical rule.
60. Set blank form with horizontal and vertical rule in different forms.
61. Set type form with horizontal and vertical rule.
62. Strike in type on machine-rule forms.
63. Set table for machine-ruled sheet.
64. Cut in vertical rules in Monotype form.

Advertising

65. How to make a layout.
66. How to set an ad, style of type, size of type, what border to use, where cuts should be placed, marking up copy.

67. How to set attractive borders, subordiated to the ad, use of hand-drawn borders, advantage of borders.

68. Arrangement of cuts, the advertiser's problem.

69. Effective ad headings.

70. Use of initials, choice of initials, alignment of initials, tone and subject harmony.

71. Advertising composition, conventional style, semi-editorial style, regular editorial style, eccentric style, cartoon and poster style.

72. How to make effective ad layouts, elements of the layouts, importance of the layout, objects of layout, background space, emphasis and strong contrast, simplicity, sensational elements, appeal to the emotions, use of pointing devices, materials needed.

73. How to put *punch* into ads, use of borders, use of white space, use of illustrations, contrast in type sizes, display lines, engraved effects.

74. How to apply principles of display, proportion, balance and symmetry, harmony, logical arrangement, contour.

Outline of Course in Arc Welding

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This article is a part of the mimeographed material on arc welding issued by the Lincoln Electric Co., Cleveland, Ohio.

The outline presented herewith is that of a 200-hour course. The student welder should complete this course with a grade of not less than 80 per cent and be able to present welds which will successfully withstand the usual physical tests applied before he is ready for production work. If he meets these standards, he should be able to qualify in production work as a competent operator.

The welding department requires that each student welder pay for the materials consumed. He should spend 12½ per cent of his time of each session on theory. The theory consists in the study of the latest developments and processes of electric arc welding, ferrous and nonferrous metals, physical testing of welds, and handling and care of equipment.

The jobs and projects outlined herewith embody the operations that a student should be able to perform upon completing a course in arc welding.

Job 1. *Flat Position Welding:* single-pass bead; single-pass bead laid in four directions; single beads, padding (½ in. high); weaved pass; weaved passes, four directions; weaved padding, single layer.

Job 2. *Plain Butt Welding:* single-pass plain butt weld, weaved-pass plain butt weld, single-beveled butt weld, single-beveled-edge butt weld.

Job 3. *Open and Closed Square and Single-V Butt Welding:* closed square butt joint, single pass; strapped open-square butt joint, weaved pass; strapped closed single-V butt joint, single and weaved pass; strapped open single-V butt joint, single and weaved pass.

Job 4. *Lap Joint:* single lap joint, single pass; single lap joint, single and weaved pass; single lap joint, three passes; single lap joint, full fillet weld (¼-in. specimen).

Job 5. *Double- and Strap-Lap Joints:* double-lap joint, single pass (⅜-in. weld); single-strap lap, joint, single pass (⅜-in. weld); double-strap lap, joint, single pass (⅜-in. weld).

Job 6. *Tee Joints:* closed-square tee joint, single pass; closed-square tee joint, three passes; open-square tee joint, single pass; open-square tee joint, three passes; closed-square tee joint, single and weaved fillet; open-square tee joint, single and weaved fillet.

Job 7. *Tee Joints, Beveled:* closed single-bevel tee joint, single pass; open single-bevel tee joint, three passes; open single-bevel tee joint, fillet weld.

Job 8. *Tee Joints, Tilted and Fillet Welds:* closed tee joint tilted, single and weaved passes; open-corner joint tilted, single and weaved passes.

Job 9. *Edge Joints:* closed butt-edge joint, single pass; open butt-edge joint, single pass.

Job 10. *Corner Joints:* closed lapped-corner joint, single pass; open lapped-corner joint, single pass; closed-corner joint, single pass; open corner joint, single pass.

Job 11. *Slot, Plug Hole, Rivet and Shaft Welding:* circular slotted lap joint, strapped plug weld, rivet welding, welding various diameter holes, building up worn shafts and ends of specimens.

Job 12. *Hot Rod Welding:* strapped single-V butt weld; closed-square tee joint, single pass; open-square tee joint, single pass; single-bevel tee joint, single pass; fillet weld, flat position, tilted, single and weaved passes.

Job 13. *Examination:* Theoretical, written; practical, manipulative work and testing of welds.

Job 14. *Vertical Position Welding:* single and weaved passes on boiler plate.

Angle of plate 23 degrees, single pass.
Angle of plate 23 degrees, weaved pass.
Angle of plate 45 degrees, single pass.
Angle of plate 45 degrees, weaved pass.
Angle of plate 90 degrees, single pass.
Angle of plate 90 degrees, weaved pass.

Job 15. *Vertical Lap Weld, 45-Degree, 90-Degree Angle:* lap weld, single pass; lap weld, full fillet weld.

Job 16. *Vertical Butt Weld, 45-Degree, 90-Degree Angle:* square-joint butt weld, single pass; square-joint butt weld, weaved pass; strapped single-V butt joint, single and weaved pass; single-V butt joint, single and weaved pass.

Job 17. *Vertical Tee Weld, 45-Degree, 90-Degree Angle:* tee weld, single pass; tee weld, ⅜-in. and ½-in. fillet welds; tee weld, single and one weaved pass, tee weld, single and three weaved passes.

Job 18. *Vertical Downhand Welding:* angle of plate in respect to base plate 45 and 90 degrees, single uniform beads, weaved uniform beads not to exceed ½ in. in width.

a) Lap Welding: lap welds, single pass; lap welds, weaved pass; lap welds, ¼-in. specimen, three passes.

b) Butt Welding: square joints butt welded, single pass; square joints butt welded, three passes; single-V butt joint, single and weaved passes.

c) Tee-Joint Welding: tee weld, single pass; tee weld, three passes; tee weld, single and weaved passes.

Job 19. *Horizontal Vertical Welding:* single uniform beads on boiler plate; weaved uniform passes on boiler plate; single uniform beads, padding on boiler plate.

a) Horizontal Lap Welding: lap weld, single pass, full fillet; lap weld, single and weaved pass; lap weld, three single passes.

b) Horizontal Butt Welding: square-joint butt welds, single and weaved passes; open single-V butt joint, three passes; open single-V butt joint, single and weaved passes; half of single-V on square-joint butt weld, three passes; half of single-V on square-joint butt weld, single and weaved passes.

c) Horizontal Tee Welding: single-pass fillet weld; three-pass fillet weld; single- and weaved-pass fillet weld.

Job 20. *Pipe Welding, Line Joints.*

a) Butt Joints: square butt joints, single pass; square butt joint, weaved pass; single-V butt joint, weaved pass; single-V butt joint, downhand, single pass; single-V butt joint, downhand, weaved pass; single-V butt joint, bell hole weld.

b) Flat Position: pipe welding, tee and flange joints; flanged tee joints, single and weaved passes.

c) Vertical Position: flanged tee joints, single and weaved passes.

d) Overhead Position: flanged tee joint, single and weaved passes.

e) Pipe Line Welding, Flat Position: orange-peel head, blunt head, welded lateral, welded nipple, welded Y.

Job 21. *Examination:* Theoretical, written; practical, manipulative work and testing of welds.

Job 22. *Overhead-Position Welding:*

a) Single uniform beads on boiler plate; uniform weaved passes on boiler plate.

b) Overhead Lap Weld: lap joints, single pass; lap joints, full fillets, ¼-in. specimen; lap joints, single and weaved passes; lap joints, three stringer passes.

c) Overhead Butt Weld: square-joint butt weld, single and weaved passes; strapped single-V open-butt joint, three passes; single-V closed-butt joint, single and weaved passes.

d) Overhead Tee Welds: single-pass fillet weld, three-pass fillet weld, single and weaved passes.

e) Overhead Corner and Edge Welds: Single passes.

Job 23. *Examination:* Practical, inspection and testing of welds.

Job 24. *Cast-Iron Welding:* repair of machine parts, repair of automobile blocks, repair of cast-iron specimens.

Job 25. *Control of Heat and Molten Metal.*

NOTE: Use two different size specimens in thickness, as one ¼ in. and one 3/16 in. and make following welds:

Welding Position	*Type of Joint*	*No. of Passes*
Flat	Lap	Single
	Butt	Single & weave
	Tee	Single
	Edge	Single
	Corner	Single
Vertical		
90-degree angle	Lap	Single
	Butt	Single & weave
	Tee	Single & weave
Vertical downhand		
90-degree angle	Lap	Single
	Butt	Single
	Tee	Single
Overhead	Lap	Single
	Butt	Single
	Tee	Single

Job 27. Sheet-metal welding.

Position	*Size of Electrode*	*Type of Joint*	*No. of Passes*
Flat	1/8-in. Bare	Lap	Single
		Butt	Single
		Tee	Single
		Corner	Single
		Edge	Single
Flat	3/32-in. Shielded Arc	Lap	Single
		Butt	Single
		Tee	Single
		Corner	Single
		Edge	Single

Job 28. *Time Study:* burning time per electrode, length 14 in., size 1/8 in., 5/32 in. and 3/16 in., maximum number of inches of travel per electrode, number of electrodes consumed per hour, number of minutes to complete a job.

Job 29. *Physical Testing of Welds:* tensile test; bend test; fillet weld test; etching test; nick break test; root break test; test for impurities in weld metal; penetration, appearance, and overlap; city water-pressure test on cylindrical and rectangular specimens.

Job 30. *Final Examination:* Theoretical, written; practical, physical testing of welds (general).

Advanced Courses

Railroad welding: rail ends, crossings, flue and firebox welding, frogs, engine repair, frame padding.

Structural steel welding and test, light-gauge steel welding, carbon arc welding and cutting, alloy steel welding, hard surfacing, tank and pressure vessel welding (class 1 vessels) and test, production welding, shipyard welding and test, boiler drums and heating units as per specifications of boiler code, state highway bridge welding and tests, Navy test, Chicago Bridge and Iron Works test, M. W. Kellogg Co. high-pressure vessel test.

Job. 26. Using 3/16-in. and ¼-in. shielded arc electrodes.

Welding Position	*Size of Electrode*	*Type of Joint*	*No. of Passes*
Flat	3/16 in. & ¼ in. dia.	Lap	Single
		Butt	Single & weave
		Tee	Single & weave
Vertical			
90-degree angle	3/16 in.	Lap	Single
		Butt	Single & weave
		Tee	Single & weave
Vertical downhand			
90-degree angle	3/16 in.	Lap	Single
		Butt	Single
		Tee	Three passes
Horizontal	3/16 in.	Butt, square	Single
		Butt, single V	Three passes
Pipe Welding	3/16 in.	Butt	Single
		Tee	Single & weave
Overhead	3/16 in.	Lap	Single
		Butt	Single
		Tee	Three passes

Text and Reference Books

Author	*Title of Book*	*Year*
TEXTBOOK		
Lincoln Electric Co.	Procedure Handbook of Arc Welding Design and Practice	1938
REFERENCE BOOKS		
Fish, Gilbert D.	Arc Welded Steel Frame Structures	1933
Russell, N. E.	Riveting & Arc Welding in Ship Construction	1934
Hubert, E. H.	Manual of Electric Arc Welding	1932
Johnson, J. B.	Airplane Welding	1929
Lincoln Electric Co.	Lessons in Arc Welding	1938
	Arc Welding in Design & Construction	1938
	Simple Blue Print Reading with Special Reference to A.W.S. Welding Symbols	1938
	The Welding Encyclopedia	1938
Campbell, Harry L.	The Working, Heat-Treating & Welding of Steel	1935
A.P.I.—ASME Code	Unfired Pressure Vessels for Petroleum Liquids and Gases	1938
ASME Code	Unfired Pressure Vessels	1934
ASA Code	Code for Pressure Piping	1935
ASTM Standards	Book of ASTM Standards Part 1 Metals	1936
ASTM	1937 Supplement of Book of ASTM Standards	1937
Maurer, E. R.	Strength of Materials	1936
Withey, M. O.		
Stoughton, B.	Engineering Metallurgy	1930
Buff, A.		
Jones, F. D.	Jigs and Fixtures Design	1937
Chaffee, W. J.	Electric Arc Welding Manual	1937
Jennings, C. H.	How to Weld 29 Metals	1937
Alum. Co. of America	The Welding of Aluminum	1937
Linde Air Products Co.	Welding Technology & Design	1936
Davis, Fred	Electric Welding	
P. R. Mallory & Co., Inc.	Engineering Data	
	Resistance Welding	
	Theory and Practice	1937
U. S. Steel Corp.	Welding Instructions and Standards, Part 1, Symbols	1938
BRITISH BOOKS		
Kilburn, W. L.	Copper and Bronze Welding	
Murex Welding Processes, Ltd.	Handbook for Electric Arc Welders	1937
Helsby, Hamann & Samuely	The Welding and Cutting Year Book	1937
Murex Welding Processes, Ltd.	The Welder	1937
TECHNICAL MAGAZINES		
The Welding Journal	Industry and Welding	
The Welding Engineer	Fabrication	
Metal Progress	Oxy-acetylene Tips	

Testing and Tests

A Testing Program

Della Gervin Freeman

Stair Technical High School,
Knoxville, Tennessee

An achievement test in English which may be found useful with prevocational students.

The markets are flooded with tests: standardized tests, inventory tests, achievement tests, prognostic tests, general intelligence tests, yet there is a need for more tests and for better testing. The teachers in technical schools who organize their own courses of study find that the majority of all those tests which are offered for sale are prepared for academic classes. They fill a recognized need but do not correlate with the work of the trade and industrial programs.

The subject content of any related course of study in a technical school can be separated into two divisions: (1) That group of facts and those fundamental tools of knowledge which are relatively permanent and which should be included in the equipment of every student, and (2) that current material which changes rapidly with the dynamic movement of industry and the progress of the social and economic order. Necessarily, two types of tests are essential for weighing the product of this dual curriculum. It has been found wise to prepare an achievement test to cover the stabilized body of organized data. It can be used from year to year and so becomes a standardized tool in each school. The test for the other information is written from term to term to provide for those evolving issues, which are requisite to injecting vitality into the successful fulfillment of the broad ideals that are the determining factor of the educational philosophy of the vocational teacher.

The basic principles governing the entire testing program are: (1) That of locating the educational level reached by the entering students and (2) that of measuring the achievement made by those students, rather than that of comparing or contrasting them with other groups which are studying under varying conditions and advancing toward somewhat different goals. The following tests are serving as a core for just such a broad testing program in the prevocational English department. It is given at the beginning of the school year. By an accurate record of the results and through a thorough analysis of the papers, the testing becomes as a barometer for registering the previous preparation of the students and for indicating their weak and their strong areas of knowledge. The process is repeated at the close of the study course and an exact correlation of their present progress with their initial accomplishment is secured. The students have successfully mastered the assigned cliffs of educational growth or they have rested for a period on a plateau of stagnation.

The scoring of the test is simple. Eighty points are possible; each question or integral part of a question counting one point of credit, and each grammatical error which is corrected in the composition content counting one point of credit. For the total score, *count the number right*. Norms and standards for rating should be derived for each educational system. Such a means of scoring helps to adjust the test to the diversified conditions which prevail from city to city. The application of this testing program becomes an identifying element for each particular school, giving emphasis to those fields of thought which most directly parallel the trends of local trade and industrial employment.

Please letter the following information:
Name .....Group. No. .....
Last First Middle
School .....Date .....

Answer the following questions with *YES* or *NO:*

1. Does a technical school educate for the professions? ....
2. Should a graduate of technical school be ready to accept a job? ....
3. Should every worker read the newspaper? ....
4. Is character necessary for success in every job? ....
5. Are most unemployed persons well trained for work? ....
6. Should a bid on a job be sent through the mail? ....

Part of the following sentences are true and part are false. If the sentence is true, place a plus (+) after it. If it is false, place a minus (—) after it.

7. *a*) A business letter should be written on one side of the paper. ....
   b) A business letter should be very neat. ....
   c) It is necessary to be very careful of spelling in a business letter. ....
   d) A business letter does not give the reader an impression of the writer. ....

Part of the following sentences are true and part are false. If the sentence is true, write *true* on the line after it. If it is false, write *false* on the line after it.

8. *a*) A dictionary is helpful in spelling new words. ....
   b) A dictionary gives more than one definition of each word. ....
   c) A dictionary tells the part of speech for each word. ....
   d) A dictionary is not a useful book for a worker. ....
9. *a*) When using a telephone one should always speak slowly. ....
   b) When using a telephone one should speak in a very loud voice. ....
   c) When answering a business telephone one should say, "Hello." ....
   d) One should not make personal calls over a business telephone. ....

Select the words of phrases which make the statements true and write them on the lines to the right. The letters before the phrases or words may be written instead of writing the entire answer.

10. The purpose of vocational guidance is to (*a*) help you pass your tests, (*b*) help you choose the job best suited for you, (*c*) make you take a certain job. ....
11. In applying for a job it would be best to (*a*) have an interview with the employer, (*b*) write a letter, (*c*) telephone the employer. ....
12. A catalog is useful for (*a*) seeing pictures of supplies, (*b*) ordering supplies, (*c*) reading for pleasure. ....
13. In making an order for tools or supplies one must list the following facts about the articles: (*a*) amount, (*b*) description, (*c*) age, (*d*) number of catalog, (*e*) price, (*f*) use, (*g*) why wanted. ....
    ....
    ....
    ....

Rearrange the following words in *alphabetical* order:

14. insulate ....
    tape ....
    science ....
    solder ....
    lathe ....
    metal ....
    forge ....
    plane ....
    chemical ....
    wiring ....

The second column contains the meanings of the words and the abbreviations in the

first column. Place the *number of the word* or the *abbreviation* in the first column on the line after the corresponding meaning in column two.

15. (1) ambition — Keeping at a job ....
    (2) perseverance — A desire to succeed ....
    (3) punctuality — Capacity to do a job ....
    (4) personal appearance — Looking your best ....
    (5) ability — Being on time ....
16. (1) f.o.b. — Charges paid before shipment ....
    (2) C.O.D. — Free on board ....
    (3) R.F.D. — Collect on delivery ....
    (4) prepaid — Rural free delivery ....
    (5) R No. 7 — Route number for county address ....

17. Write the months of the year in their proper order. Do *not* use abbreviations.
    1. .....
    2. .....
    3. .....
    4. .....
    5. .....
    6. .....
    7. .....
    8. .....
    9. .....
    10. .....
    11. .....
    12. .....

Rewrite the folowing *dates* as they should be:

18. *a*) july 4, 1938 — *a*) ....
    b) September fourth, 1938 — *b*) ....
19. *a*) Dec. 10th 1938 — *a*) ....
    b) April 1, '39 — *b*) ....

Rewrite the following *sentences* as they should be:

20. *a*) It is me. — *a*) ....
    b) Can I go? — *b*) ....
21. *a*) I have took it. — *a*) ....
    b) He give me a job. — *b*) ....
22. *a*) John and me go there. — *a*) ....
    b) I done the work. — *b*) ....
23. *a*) John throwed it. — *a*) ....
    b) He gave the orders to I. — *b*) ....
24. Correct the mistakes in the following *heading* for a letter:
    Stair Technical High School, ...
    City Hall Park ....
    Dec 1 1938 ....
    knoxville tennessee ....
25. Correct the mistakes in the following *address:*
    mr john brown ....
    104 gay street ....
    Knoxville, Tennessee ....

Standardized Test for the Industrial-Arts General Shop

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Aims:

The aims of this test are threefold;

1. It may be given at the end of the school year for a final rating of the pupil.

2. It may be given as a means of forming a basis for reteaching and review.

3. It may be given at the beginning of a school year to determine the type of instruction that is to follow.

In administering the tests the following steps should be taken by the examiner;

1. Present each pupil with a copy of the test.

2. Have each pupil fill in the necessary information on page 1 (caution pupil not to turn page).

3. Read the following paragraph, having the pupils paying strict attention. Pupils' desks should be free of pencils, papers, etc.

You have just been given a test to determine your ability in the industrial-arts general shop. You will be given one hour and twenty minutes to complete the test. When you have answered all the questions, or as many questions as you can, in the first group, do not stop, but continue on to the second group, and then to the third group. Look your test over very carefully.

Are there any questions? (Examiner to answer any questions of a general nature pertaining to instructions.) Have the pupils begin at a signal to start and place on the board the time when test must stop.

Scoring

To determine the score of a pupil, consult the following tables:

If a pupil in the 8th grade, for example, is between the ages of 13 years 6 months, and 14 years 6 months, follow down the left side of Table I until you come to grade 8, and the years 13^6–14^6. Then follow this line horizontally to the right and the figures that are found under the various headings are the grades the pupils should approximately obtain.

GRADE	YEAR	MEAN	MEDIAN	MODE
7	11^6–12^6	57	59	57
7	12^6–13^6	64	59	60
7	13^6–14^6	67	63	62
8	12^6–13^6	67	65	65
8	13^6–14^6	68	70	70
8	14^6–15^6	74	85	90
9	13^6–14^6	103	103	100
9	14^6–15^6	104	105	110
9	15^6–16^6	108	110	115

Table 1

GRADE	7			8			9		
AGE	11^6–12^6	12^6–13^6	13^6–14^6	12^6–13^6	13^6–14^6	14^6–15^6	13^6–14^6	14^6–15^6	15^6–16^6
DECILES 10	48	48	51	55	59	61	65	72	81
20	52	52	53	56	63	64	68	83	84
30	56	56	58	58	67	68	77	89	89
40	58	58	61	63	69	72	89	96	97
50	61	61	63	65	72	74	100	103	108
60	64	66	70	73	74	81	111	114	115
70	68	69	72	78	79	83	113	119	120
80	72	73	75	81	84	87	117	122	129
90	78	79	82	85	90	94	125	127	134

Table 2

In Table II, the percentiles are divided into deciles. If a pupil has a score that falls in the 7th decile, it can be assumed that the pupil is superior to 70 per cent of the pupils in the industrial-arts general shop.

A useful test for the general shop in which woodworking, mechanical drawing, and electricity are taught

Test

Letter neatly, in the following blanks, the necessary information.

Name .....Date.....19...
(first) (initial) (last)

Age ..... Birthday.....
(last birthday) (month) (day) (year)

School ..... City..... State....

Grade ..... Instructor .....

Instructions

Do not turn this page until you know all instructions pertaining to this test. The general instructions will be read and you may ask any questions regarding the instructions before you begin the test. No questions will be asked or answered after the test begins. You will be given one hour

and twenty minutes to complete your work. Any figuring should be done in the left margin. (Heed instructions.)

True and False

Below are statements, some true and some false. If the statements are true, write True in the space provided. If the statements are false, write False in the space provided.

Example: Honesty is the best policy. True

1. Soap is used on a screw when entering a piece of wood to overcome the expansion of wood. ....
2. When using a chisel, always chisel away from the body to prevent an accident. ....
3. When a bevel is made only a corner of the material is cut away. ....
4. A bench hook is a fastener used to fasten the bench to the floor. ....
5. Sizing end grain for gluing means to find how much material is to be glued so that an overamount of glue will not be used. ....
6. When applying the shellac the brush must not be brushed over the surface more than necessary. ....
7. A table top should never be glued to the rails of the table. ....
8. The face of a hammer is rounded so as to prevent the wood from being marred when a nail is driven to the surface of the wood. ....
9. The scale on a marking gauge is not correct, hence it should not be used. ....
10. A chisel should always be placed on the grinder before sharpening. ....
11. When measurements do not have to be accurate, a pencil may be used to guide the cut. ....
12. A screw can be driven easier with a brace having a 6-in. swing than with one having a 4-in. swing. ....
13. A marking gauge should always be pushed away from the marker. ....
14. All measurements should be taken from the work face, work end, and work edge of a board. ....
15. F.H.B. screws mean *for hand boring*. ....
16. To chamfer a board means to plane away only part of the corner of the board. ....
17. Oil is used on an oilstone to keep the stone wearing flat. ....
18. A nailset is used to hold a nail in place until it is driven. ....
19. A screw driver should be ground to the shape of a chisel edge. ....
20. Pumice stone is used to whet a chisel. ....
21. A drawknife is used in the construction of a drawer. ....
22. In turning wood spindles on a lathe a faceplate is used. ....
23. The turning gouge is used mostly for rough turning. ....
24. It is usually good practice to put two or three coats of finishing material on a project in one day. ....
25. When mounting a live center in a piece of stock to be turned on the lathe, the live center should always be removed from the lathe. ....
26. Sapwood is harder than heartwood. ....
27. Wood expands in drying. ....
28. Double *ought*, or No. 00 sandpaper is used for *finish sanding* wood. ....
29. A bench top is made of narrow strips of wood to prevent warping. ....
30. When sawing lengthwise of a board a ripsaw is used. ....
31. When a voltmeter is connected to a circuit, it must always be connected "in the line." ....
32. The kind of current produced by a storage battery differs from the kind produced by a dry cell. ....
33. Copper is a better conductor of electricity than iron. ....
34. The polarity of an electromagnet is changed when the direction of the current is changed. ....
35. The current in a circuit is equal to the volts in a circuit multiplied by the ohms in a circuit. ....
36. The purpose of a fuse in a circuit is to prevent a short circuit. ....
37. If dry cells are connected in series they are connected similar to a group of men one behind the other pulling a rope. ....
38. A vibrating bell will operate on both a.c. and d.c. current. ....
39. When mixing the solution of a storage battery, acid is poured into the water. ....
40. Ten dry cells in good condition, when connected in parallel, have a pressure of 15 volts. ....
41. The positive terminal of a dry cell is carbon. ....
42. A penny in a fuse box works just as well as a fuse. ....
43. The underwriter's knot is used to lessen strain on the connections on an extension cord. ....
44. When winding a coil of more than one layer, the direction of the coil is reversed for each additional layer. ....
45. A pigtail is used at a terminal to give a job a better appearance. ....
46. The lines of force around a magnet are imagined as entering the north pole after leaving the south pole. ....
47. When a wire is passed through a magnetic field, a current is produced in the wire. ....
48. Electroplating, in most cases, is the process of coating a base metal with a more precious metal. ....
49. Galvanized iron is coated with zinc. ....
50. A rivet set is used to make holes for rivets. ....
51. The teeth on a jeweler's saw blade point toward the handle. ....
52. Peening copper tends to soften it. ....
53. There is only one accurate method of laying out centers for work to be turned on the lathe. ....
54. The live center of a lathe does not need to be lubricated. ....
55. The dead center on the lathe should be somewhat tighter when polishing than for turning. ....
56. Draft is a term which refers to the shape of the pattern. ....
57. The opening cut to allow the metal to enter the mold is known as the sprue. ....
58. Micrometers will measure accurately to within .001 in. ....
59. Cast iron is rolled into sheets. ....
60. It is not good practice to use oil on large metal-cutting drills. ....
61. Large drills are run slower than small drills. ....
62. Pipe threads are usually tapered. ....
63. Solder is half lead and half zinc. ....
64. A soldering flux is used to promote fusion. ....
65. Tin plate is used for cans because it is clean and rust resisting. ....
66. Hack saws and files cut well on both forward and backward strokes. ....
67. Alloy metals are made from two or more metals. ....
68. To obtain a side view of an object, the top and front views are projected so as to intersect. ....
69. Dimensions should, when possible, be placed not more than a ¼ in. nor less than 3/16 in. from the object. ....
70. Lettering is used on a drawing because of the ease with which it is applied. ....
71. To make any geometric construction, all the tools necessary are the pencil, rule, and compass. ....
72. In a drawing made quarter size a line actually 6 in. long would be represented by a line 1.5 in. long. ....
73. A picture drawing is usually the best type of working drawing. ....
74. Red and green are complementary colors. ....
75. When a cut is received, even though small, it should be treated. ....
76. When operating a machine, the operator should have his arms, neck, etc., free from loose or dangling clothing. ....
77. When purchasing an article of furniture, its value can be more easily judged if the type of joints that were used in its construction are known. ....
78. Introduction of the machine in performing operations on wood has greatly decreased the need for men to become skilled in hand woodworking. ....
79. The woodworker of today, who has become a master of the art, is still in demand. ....
80. It is not necessary for a mechanic to understand the fundamentals of mechanical drawing as a drawing is usually furnished him when a job is to be completed. ....

Completion

Place in the space at the right margin the word or words that should be where the blanks are in the following sentences in order that the following sentences shall be most correct.

Example: Honesty is the .... policy. best

81. A groove runs .... the grain of a piece of wood. ....
82. A dado runs .... the grain of a piece of wood. ....
83. A plane iron should have its bevel ground to about .... degrees. ....
84. The .... should always run as much as possible the length of a piece of wood. ....
85. The substance used to thin lacquer is ....
86. If a certain kind of lumber sold for 15 cents per board foot, a

piece measuring 10 ft. x 12 in. x 1½ in. would cost, ...
87. Sanding across the grain of wood will result in .... showing when the wood is "finished." ....
88. In making a picture frame the .... joint is usually used. ....
89. The part that fits into the "hole" of a mortise-and-tenon joint is called the ....
90. The tool used to bend the edge of a scraper is called a ....
91. When boring, the bit is not driven entirely through the wood to prevent the wood from ....
92. When applying hide glue to wood, it should be applied while it is ....
93. Light showing under a square tells that the object is not ....
94. The action of a ripsaw is like a group of ....
95. If two pieces of wood were to be fastened end to end, the .... joint may be used. ....
96. A tool used to clean a file is a ....
97. When the head of a screw is set below the surface, the screw is said to be ....
98. The unit of resistance is the ....
99. The north pole of a compass points .... and the south pole ....
100. If the length of a wire is increased the resistance ....
101. The electric meter in our homes is called a .... meter. ....
102. The contact point of a virbrating bell .... and .... the circuit. ....
103. When a fuse is said to have "burned out," the wire inside the fuse has ....
104. The instrument used to test a storage-battery solution is the ....
105. When one button is to control two bells or more the bells are connected in .... with each other. ....
106. All splices must be .... and .... secure. ....
107. To joint two wires end to end the .... splice is used. ....
108. In cutting a hole through a wall or mop board a .... is usually used. ....
109. The plugs that are removed from an outlet box are called ....
110. Length and width of an object are usually shown in .... view. ....
111. All dimensions up to .... inches are denoted in inches. ....
112. The widest letter in upper-case lettering, is the ....
113. When working at a drafting table the draftsman should have the light come from the .... side. ....
114. A man noted for the conservation of our forests is ....
115. Our homes are taxed according to the .... valuation they have. ....
116. Turpentine is made from the .... of pine trees. ....
117. The .... of a board is measured across the grain. ....
118. A board 72 in. long is .... yards long. ....
119. A pint of water weighs approximately ....
120. A patch of concrete 6 in. by 4 ft. by 8 ft. would contain .... cubic feet. ....

Multiple Choice

Select and place in the space in the right margin the number that makes each of the following statements most correct.

Example: Honesty is the (1) best, (2) new, (3) last policy. 1

121. A board foot has dimensions of (1) 12 by 12 by 12 in., (2) 12 by 12 by ½ in., (3) 12 by 12 by 1 in. ....
122. The amount of lumber needed and other information necessary to complete a project is called (1) a bill of sale, (2) manufacturer's estimate, (3) a bill of material. ....
123. When gluing four long boards, side by side, all boards are to be glued (1) at once, (2) separately to one selected as an original one, (3) in pairs and then combined to make four. ....
124. The kerf of a saw is (1) that part of the lumber made into sawdust, (2) the number of teeth a saw has, (3) the space the set of a saw makes to prevent the saw from binding. ....
125. When making a mallet a (1) hardwood, (2) soft wood, (3) medium wood should be used. ....
126. The joint to be used when placing the stretchers in a frame for a table is (1) the mortise and tenon, (2) butt, (3) dowel. ....
127. Miter joints are cut at an angle of (1) 30 degrees, (2) 60 degrees, and (3) 45 degrees. ....
128. When upholstering a footstool the tacks should be placed (1) from ends to center, (2) center to ends, (3) either way. ....
129. A seven-point saw, has (1) seven teeth, (2) seven points of teeth per inch, (3) seven teeth per inch. ....
130. If a saw is made to follow directly on the line marking the correct length of a board, the board when completed will be (1) exactly to size, (2) oversize, (3) undersize. ....
131. To secure two pieces of wood, a screw, if properly set, has (1) more value than, (2) less value than, (3) the same value, as a properly driven nail of similar diameter. ....
132. No. 1 sandpaper is (1) coarser, (2) finer, (3) of the same grade as ought (0). ....
133. Shellac is a by-product of (1) paint, (2) lacquer, (3) lac bug. ....
134. A spoke shave is usually used for surfaces that are (1) curved, (2) jagged, (3) straight. ....
135. Using a block under the claws of a hammer when withdrawing a nail (1) prevents the claws from breaking, (2) allows the nail to be withdrawn easier, (3) prevents the wood from splitting. ....
136. A stain is used (1) to bring out the natural beauty of the wood, (2) to protect the surface of the wood from being marred, (3) because it is easy to apply. ....
137. To cut a piece of wood to a circular shape (1) the circular saw, (2) band saw, (3) jointer is used. ....
138. If a permanent magnet is broken into a number of pieces, (1) each piece becomes a magnet, (2) magnetism is no longer contained in the pieces, (3) the molecules escape and form a disorderly appearance. ....
139. If the diameter of a wire is increased the resistance (1) increases, (2) decreases, (3) remains the same. ....
140. When paying for electrical power consumed we pay by the (1) watt, (2) kilowatt, (3) kilowatt hour. ....
141. If the cost per kilowatt hours is 8 cents the cost to run a hundred-watt lamp two hours every day for 30 days would be (1) 48 cents, (2) $4.80, (3) $.048. ....
142. An ammeter is always connected to a circuit (1) in parallel, (2) in series, (3) either way. ....
143. When a person becomes electrocuted the property of the current that kills him is (1) voltage, (2) voltage and amperage, (3) amperage. ....
144. Lamps connected in parallel (1) decrease in brightness, (2) increase in brightness, (3) remain the same in brightness. ....
145. A fully charged storage battery will register (1) 1080, (2) 1280, (3) 1180 specific gravity. ....
146. When reading a kilowatt-hour meter, the dials are read (1) from left to right, (2) from right to left, (3) either way. ....
147. The filament used in an electric toaster is made of (1) iron, (2) copper, (3) nichrome wire. ....
148. A flush switch is usually installed in the (1) wall, (2) ceiling, (3) floor. ....
149. The star drill is used to cut holes in (1) wood, (2) iron, (3) cement. ....
150. When a circuit is shorter, (1) the current cannot flow through its intended course, (2) not enough wire has been used, (3) the circuit can be used for only a short period of time. ....
151. In orthographic projection views are (1) above or below one another, (2) along side of each other, (3) in three planes that are perpendicular to each other. ....
152. Invisible edges are represented by lines that (1) cannot be seen, (2) are not shown, (3) are broken. ....
153. A dimension line is usually a (1) very heavy, (2) very light, (3) medium line. ....
154. A working drawing is usually based on (1) orthographic projection, (2) isometric projection, (3) first-angle projection. ....
155. Letters of the alphabet that are not capitals are called (1) little letters, (2) small letters, (3) lower case. ....
156. The best type of drawing to use in connection with making an object is (1) a picture drawing, (2) working drawing, (3) freehand sketch. ....
157. The diameter of a circle equals (1) $2\pi r$, (2) πr, (3) πd^2. ....
158. Chippendale is a type of (1) glassware, (2) furniture, (3) metal. ....

159. Five eighths of an inch expressed decimally is (1) .580, (2) .125, (3) .625. ....
160. All working parts of a machine should be (1) left open, (2) guarded, (3) painted to prevent rust. ....

Key to Test

1. False	14. True	27. False
2. True	15. False	28. True
3. False	16. True	29. True
4. False	17. False	30. True
5. False	18. False	31. False
6. True	19. False	32. False
7. True	20. False	33. True
8. True	21. False	34. True
9. False	22. False	35. False
10. False	23. True	36. False
11. True	24. False	37. True
12. True	25. True	38. True
13. True	26. False	39. True
40. False	62. True	84. grain
41. True	63. False	85. thinner
42. False	64. True	86. $2.25
43. True	65. True	87. marks, scratches
44. False	66. False	88. miter
45. False	67. True	89. tenon
46. False	68. True	90. burnisher
47. True	69. False	91. splitting, cracking
48. True	70. True	92. hot
49. True	71. True	93. square
50. False	72. True	94. chisels
51. True	73. False	95. end lap
52. False	74. True	96. file card
53. False	75. True	97. countersunk
54. True	76. True	98. ohm
55. False	77. True	99. south, north
56. True	78. True	100. increases
57. True	79. True	101. kilowatt hour
58. True	80. False	102. makes, breaks or opens, and closes
59. False	81. with	103. melted, burned
60. False	82. across, against	104. hydrometer
61. True	83. 25	105. parallel
		106. mechanically, electrically
		107. Western Union
		108. Compass saw
		109. knockouts
		110. top
		111. 24
		112. W
		113. left
		114. Theodore Roosevelt
		115. assessed
		116. sap
		117. width
		118. two
		119. one
		120. 16
		121. 3
		122. 3
		123. 3
		124. 3
		125. 1
		126. 1
		127. 3
		128. 2
		129. 2
		130. 3
		131. 1
		132. 1
		133. 3
		134. 1
		135. 2
		136. 1
		137. 2
		138. 1
		139. 2
		140. 3
		141. 1
		142. 2
		143. 2
		144. 3
		145. 2
		146. 2
		147. 3
		148. 1
		149. 3
		150. 1
		151. 3
		152. 3
		153. 2
		154. 1
		155. 3
		156. 2
		157. 1
		158. 2
		159. 3
		160. 2

Miscellaneous

Present Status of Industrial Education in Seventy-Nine Secondary Schools

C. Taylor Whittier
Chicago, Illinois

The collection of the data for the present study was the result of a joint project of The Metropolitan Industrial Arts Round Table of Chicago and The Judd Club of the University of Chicago. The material was collected by means of a questionnaire devised by V. E. Breidenbaugh, H. D. Campbell, W. E. Durbahn, H. C. Taylor, and L. C. Smith, Chairman, and sent to all members of both organizations.[1]

[1]Copies of the original data as reported at a joint meeting of the two groups may be secured for 25 cents (by mail) by writing L. C. Smith, University High School, University of Chicago.

Classification	Frequency of Smith-Hughes offerings		Frequency of non-Smith-Hughes offerings		Frequency of vocational course offerings	
	No.	Per cent	No.	Per cent	No.	Per cent
Evening Trade Extension	15	20.0	3	4.0	18	24.0
Part-time Extension (Apprentices)	13	17.3	1	1.3	14	18.6
Part-time Trade Preparatory (Cooperatives)	5	6.7	x	x	5	6.7
Part-time General Continuation	2	2.7	x	x	2	2.7
General Industrial Full-time	7	9.3	x	x	7	9.3
General Technical	x	x	5	6.7	5	6.7
Unit Trade Full-time	20	26.7	4	5.3	24	32.0
Total offerings	62	82.7	13	17.3	75	100.0

x classification not offered
Table I. Frequency of types of vocational offerings in 36 schools

PART I

The story was undertaken to determine the status and effectiveness, so far as is evidenced by the selected factors noted later, of the industrial-education programs in 79 secondary schools located in 18 states. The industrial-education programs are divided into vocational and nonvocational offerings. The vocational offerings are of two types, the "Smith-Hughes" or vocational training for trades and industries, and the "non-Smith-Hughes" or technical courses.

Thirty-four schools offered both vocational and nonvocational courses, 43 schools offered only nonvocational courses, and two schools offered only vocational courses. The schools range in size of pupil enrollment from 125 to 8,228.

In the 74 schools for which data are complete, the enrollment in various industrial-education classes represents 56.1 per cent of the total school enrollment. In the 33 schools offering vocational courses, 15.9 per cent of the total pupil enrollment is represented in these classes, while in the 70 schools offering nonvocational industrial-education courses 51.5 per cent of the total pupil enrollment is found in such classes.

The pupils enrolled in industrial-education courses in 31 schools, offering both types of work, are divided between vocational and non-vocational offerings, the former representing 30.2 per cent, and the latter 69.8 per cent of the pupils so enrolled. Thus about one third of the pupils engaged in industrial-education courses are pursuing the vocational offerings, and about two thirds are engaged in the non-

A worth-while piece of research work in the realm of industrial education.

Classification	Pupils enrolled in Smith-Hughes classes		Pupils enrolled in non-Smith-Hughes classes		Total pupils enrolled in vocational classes	
	No.	Per cent	No.	Per cent	No.	Per cent
Evening Trade Extension	2,790	27.4	83	0.8	2,873	28.2
Part-time Extension (Apprentices)	856	8.4	87	0.9	943	9.2
Part-time Trade Preparatory (Cooperatives)	162	1.6	x	x	162	1.6
General Industrial Full-time	1,205	11.8	x	x	1,205	11.8
General Technical	x	x	1,230	12.1	1,230	12.1
Unit Trade Full-time	2,947	28.9	837	8.1	3,784	37.1
Total pupils	7,960	78.1	2,237	21.9	10,197	100.0

x classification not offered. Part-time general continuation enrollment not reported
Table II. Pupil enrollment in 36 schools

vocational selections in schools where both types are offered to the pupils.

Vocational Offerings

The vocational offerings of the 36 schools having this type of work are classified under seven divisions.[2] The relative importance of the Smith-Hughes and non-Smith-Hughes vocational work carried on in 36 schools can be seen in detail in Table I. Smith-Hughes classes are given in 88.9 per cent of the schools, and the non-Smith-Hughes classes are offered in 36.1 per cent of the schools. The non-Smith-Hughes work includes those schools offering general technical training and the schools offering work directly comparable to the Smith-Hughes program. The degree of emphasis on the various classifications of the vocational work is shown in the table. Some schools offer only one type of work while others offer several types. A very few of the 36 schools offer both vocational and nonvocational classes. The unit-trade courses are given most frequently, being offered by 61.1 per cent of the schools which have a vocational program. The evening trade-extension program is next, being offered by 44.4 per cent of the schools.

Name of Course	Number of schools offering course	Total number of pupils enrolled in course	Per cent of pupils enrolled in industrial education in schools offering the course
UNIT TRADE			
Auto Mechanics	13	352	9.3
Printing	11	281	2.0
General Electricity	10	314	2.3
Machine Shop	10	753	5.3
Architectural Drawing	5	170	1.8
Pattern Making	5	66	2.4
Machine Drawing	6	154	4.5
Cabinet Making	4	74	7.2
Carpentry	4	79	13.2
General Wood Shop	4	101	1.8
GENERAL INDUSTRIAL			
Auto Mechanics	2	83	1.4
General Building	2	65	9.1
Printing	2	111	4.2
APPRENTICES			
Machine Shop	10	431	9.1
Pattern Making	5	35	1.2
Carpentry	4	50	1.3
Sheet Metal	4	17	1.1
Gas and Electric Welding	3	5	0.4
Machine Drawing	3	44	2.3
Welding and Foundry	3	40	2.3
COOPERATIVES			
Auto Mechanics	4	48	4.1
Gas and Electric Welding	2	5	0.5
Machine Trades	2	72	10.1
EVENING SCHOOL			
Machine Shop	11	627	7.4
General Mechanical Drawing	9	182	2.5
General Electricity	9	193	2.0
Auto Mechanics	7	189	2.7
Machine Drawing	7	162	3.7
Gas and Electric Welding	6	141	2.5
Blue Print Reading	4	205	4.7
Pattern Making	4	59	1.6
Printing	4	37	1.3

Table III. Smith-Hughes vocational courses

Name of Course	Number of schools offering course	Total number of pupils enrolled in course	Per cent of pupils enrolled in industrial education in schools offering the course
UNIT TRADE			
Auto Mechanics	3	130	11.8
Machine Shop	3	234	21.2
General Electricity	2	108	9.8
General Mechanical Drawing	2	86	7.8
Pattern Making	2	63	8.9
EVENING SCHOOL			
Bookbinding	2	33	2.1
GENERAL TECHNICAL			
General Mechanical Drawing	3	534	21.2
Printing	3	112	3.0
Auto Mechanics	2	122	3.9
Cabinet Making	2	85	13.2
General Electricity	2	90	3.6
Woodturning	2	34	5.3

Table IV. Non-Smith-Hughes vocational courses

The pupil distribution in the foregoing classifications is shown in Table II. From the point of view of the number of pupils enrolled, the unit trade ranks first, and the evening trade extension ranks second. This may be expected, as these two types of work are offered in more schools than are any of the other classifications. It is to be noted that 38.9 per cent of the schools offer part-time extension courses but that only 9.2 per cent of the pupils enrolled in vocational classes are taking this work.

The specific vocational courses offered by the 36 schools are presented in Tables III and IV. These schools offered 59 different subjects in 341 classes. Many subjects were offered by only 1 or 2 schools, so for the sake of space, the lower frequencies are omitted.

There are 30 unit-trade courses offered by 20 schools. Those offered by 4 or more schools appear in Table III. No one of the 13 general industrial full-time courses offered by 7 schools are given by more than 2 schools. The 20 part-time trade-extension courses in 13 schools are scattered, each course being offered by from 1 to 5 schools. Five schools offered 9 courses in part-time trade-preparation courses, 6 courses being offered by only 1 school. Table III also includes the evening extension courses offered by 16 schools. Thirty-four courses are offered by these schools, many reflecting a distinctly local need, as is evidenced by the fact that 22 of the courses are offered by only 1 or 2 schools, and 25 by 3 or less schools. On the other hand, 3 courses are offered by more than half of the schools.

Table IV presents the situation as to the non-Smith-Hughes offerings. This work is limited as only 2 private schools and a small number of public schools in this report offer vocation training without the benefit of federal aid. The 13 unit-trade courses are offered by 4 schools, 8 courses being offered in only 1 school. The apprentice work in this division was extremely limited, all being offered by 1 school, which did, however, offer 10 courses. Five evening trade-extension courses are offered by 3 schools, 1 being offered by more than 1 school.

Nonvocational Offerings

In the 77 schools which offer nonvocational courses there are 567 classes divided among 46 subjects. Table V presents all of the courses offered by more than 3 schools. Fourteen courses are offered by 1 school, 7 by 2 schools, and 5 by 3 schools. The remaining 20 courses are shown in Table V. Five courses are offered by more than half of the schools, 3 of these are drawing courses.

Name of Course	Number of schools offering course	Total number of pupils enrolled in course	Per cent of pupils enrolled in industrial education in schools offering the course
General Mechanical Drawing	63	12,833	22.1
General Wood Shop	57	11,467	17.5
Architectural Drawing	42	1,559	3.3
Printing	42	4,743	8.5
Machine Drawing	40	2,254	4.8
Auto Mechanics	35	4,151	7.5
Cabinet Making	32	7,721	18.0
General Electricity	32	5,235	9.5
General Metal Shop	28	3,787	8.8
General Shop	26	2,084	5.5
Pattern Making	22	1,183	7.0
Machine Shop	19	2,110	11.3
Home Mechanics	15	287	1.0
Sheet Metal	15	719	8.5
Aeronautics	12	699	1.9
Forging	12	253	0.9
Art Metal	11	294	1.0
Gas and Electric Welding	10	257	0.9
Molding and Foundry	7	730	17.8
Woodturning	6	299	9.8

Table V. Nonvocational industrial education courses offered by more than three schools

Vocational Courses	Nonvocational Courses	Total Industrial Education
Auto Mechanics	General Mechanical Drawing	General Mechanical Drawing
Machine Shop	Machine Shop	General Wood Shop
General Electricity	General Wood Shop	Auto Mechanics
Printing	Architectural Drawing	Printing
General Mechanical Drawing	Printing	General Electricity
Machine Drawing	Machine Drawing	Machine Drawing
Pattern Making	Auto Mechanics	Architectural Drawing
Gas and Electric Welding	Cabinet Making	Cabinet Making
Carpentry	General Electricity	Pattern Making
Sheet Metal	General Metal Shop	General Metal Shop
General Wood Shop	General Shop	Machine Shop
Architectural Drawing	Pattern Making	General Shop
Cabinet Making	Machine Shop	Sheet Metal
General Metal Shop	Sheet Metal	Gas and Electric Welding
	Home Mechanics	

Table VI. Courses most frequently offered in industrial education listed in order of frequency

Girls are enrolled in 17 of the nonvocational courses and in 7 of the vocational courses. The numbers of girls enrolled in any one course is small except in a few schools where an effort is made to serve the girls in certain classes.

It is interesting to compare the subject most frequently offered in the vocational and nonvocational fields. Table VI lists the courses in their descending order of frequency under each heading. There are 12 courses in each division which appear in the other divisions. The column *Total Industrial Education* ranks the 908 classes according to the number of times they are offered.

The total number of courses and classes offered has changed during the 5-year period 1932–33 to 1937–38. The number of classes has increased from 793 to the

[2]The federally aided program is described and interpreted in *Statement of Policies for the Administration of Vocational Education*, Vocational Education Bulletin No. 1, Washington, Government Printing Office, 1937 (revised).

908 previously noted. This represents an increase of 14.5 per cent. During the same period there was an increase of 10.4 per cent in the variety of courses offered, from 67 to 74 different courses. Only 8 schools reduced their total offerings during this period, and these by very small numbers. One hundred forty classes were added by 54 schools, 25 classes were dropped by 18 schools. Eight courses were both added and dropped by some schools during the 5 years. The total increase was divided as follows: 77.9 per cent in the day-school offerings, and 22.1 per cent in the evening-school program.

The courses which showed at least 10 per cent increase in number of times offered during the 5-year period and which were offered at least 12 times during the year 1937–38, are as follows: Aeronautics, art metal, auto mechanics, carpentry, gas and electric welding, general electricity, general metal shop, general shop, home mechanics, machine shop, molding and foundry, printing, and sheet metal. The courses which showed a decrease of at least 10 per cent during the period and which were offered during the school year 1937–38 are as follows: Concrete and brick, forging, plumbing, and wood turning.

Curriculum Offered

The 79 schools offer 908 different classes in industrial education, which can be divided into 74 different courses. Most of the schools organize the courses into definite curriculums.

Vocational curriculum appears in 77.8 per cent of the schools which offer vocational courses, while 80.5 per cent of the schools which have nonvocational courses have nonvocational curriculums. In the schools which have both vocational and nonvocational courses 61.8 per cent have curriculums in both fields.

The length of the vocational curriculum varies from 1 to 4 years. Twenty-two or 78.6 per cent of the schools with a vocational curriculum have either a 2 or a 4-year curriculum. The length of the curriculum in the nonvocational field varies more than in the vocational field, ranging from 1 semester to 6 years, and in one case until graduation. Of the schools with a nonvocational curriculum 35 or 56.5 per cent have either a 2- or a 4-year curriculum. If 1 more unit — the 3-year curriculum — is included, it is found that 85.5 per cent of the schools with a nonvocational curriculum have 1 of these 3 lengths, and 96.4 per cent of the schools with a vocational curriculum are found to have 1 of these 3. Of the 90 curriculums offered by the schools having industrial education, 88.9 per cent are for periods of 2, 3, and 4 years.

Credit Granted for Industrial-Education Courses

The schools which offer work in industrial education vary greatly in the amount of credit which they grant toward graduation. The schools range from no credit, to all credit needed by a pupil to receive his high-school diploma.

Practical Maintenance Construction and Production Work

Forty-seven or 60 per cent of the schools provide an opportunity for pupils to take part in practical maintenance construction or production work. Five of these schools indicate that they do not do so extensively. Forty-five of the schools indicated the manner in which this type of work was assigned. There was a great variety in the practices followed by the various schools.

PART II

Personnel Practices

This grouping is intended to include all those activities "having to do with gathering and disseminating information about the pupils, teachers, schools, industries, which are necessary to understand, analyze, interpret, formulate, and evaluate a constructive program of co-ordinated enterprise."[3]

Pupil Selection

It has been the practice for some time to place those pupils, who are unable to do the academic work, in the classes which require more of the physical activity. It has also been a place where pupils who were problems in conduct were sent to try to straighten them out. This has in a way indicated a recognition that learning and interest in school are aided and stimulated by "doing." However, as the realization has developed that pupils who are of low mental ability and who are chronic disciplinary problems will not necessarily make a greater success in a skilled trade than in any other occupation, schools have begun requiring pupils to give some indication of proficiency and desire before specializing in a certain trade. The exact position of the schools in this study is as follows: 23, or 29.1 per cent, of the schools report that pupils are placed in industrial-education classes without regard for their special fitness; 40, or 50.6 per cent, reply that pupils are not placed in industrial-education classes without regard for fitness for the work; 3 schools, or 3.8 per cent, have modified methods; and 13, or 16.5 per cent, of the schools gave no answer. The 3 schools which modify their program do so in different ways. One school permits pupils in classes without regard for special fitness if the pupils elect the course, evidently indicating that the urge must come from the pupil, and not from the teacher. One school permits pupils in industrial-arts classes without regard for special fitness, but not in vocational classes. One school permits pupils in the industrial-arts classes if of low mentality, but not because they are chronic disciplinary problems.

This seems to show that the industrial-education classes of the schools are not the *dumping ground* for all pupils who cannot or do not make satisfactory progress in the regular work. If the schools are to undertake the responsibility of giving training and experience to all pupils which will make the pupils better able to cope with society, the schools will have to provide some other vocational training fitted to the demands of this subnormal group.

Only 20 schools are really trying to conduct a definite program to meet the needs of this subnormal group of pupils. This represents, judging by some of the answers, most, if not all of the schools which are doing anything to meet the situation. Judging from the group of 79 schools only 25.3 per cent are really meeting the situation.

Another example of the type of control which is exercised in selecting pupils for industrial education is manifested in the specialized vocational courses — the unit trade courses — as a level of instruction where the methods of selection should be most highly developed. This type of course represents the terminal training in day school, at least for most of the pupils taking vocational courses. Twenty of the 22 schools which offer unit-trade courses reported. Eight schools, or 36.4 per cent, have no requirements at all, relying on the ability of the pupil to make his own selection. One school adds to this an attempt to guide the selection.

The largest group; namely, 9 schools, require that the pupils demonstrate their interest, aptitude, and intelligence in nonvocational industrial-arts work. This assures the pupil of some basis for his selection of the particular unit shop in which he wishes to work. It also gives the schools a chance to determine whether the pupil has a reasonable chance for success in that vocation. One school reports that the parents are consulted in the selection of a unit shop. As the parents have a strong interest in the pupils' selection, it would seem that they might be consulted oftener than is indicated in this report. One school reports the use of aptitude tests to aid in selecting the shop course.

Community Surveys and Methods of Evaluation

Public education is to a large extent a local matter. Any one school serves the youth in a relatively small area. Many of these pupils will go into vocations which offer opportunities within this area, others, of course, go to distant points; but if the school cannot hope to train for all vocations, it must train for those vocations which can provide a means of making a livelihood for the youth within its jurisdiction. The survey of the community should take into consideration general industrial trends, but if some particular industry in its area persists in demands for certain vocations the school can well afford to offer the necessary training, but it should be ever on the alert lest it find

[3] C. Taylor Whittier, "Present Status of Vocational and Nonvocational Offerings in 79 Secondary Schools," A. M. Thesis, University of Chicago, 1938.

that pupils are being trained for vocations no longer demanded. The need for recent and accurate information about the demands of industry and the possible changes in the future is self-evident. The value of educating the consumer, producer, and general public about the requirements of industry for special educational training (which must be met if the school is to promote the maximum of social and economic welfare), justifies the survey as a vital organ in any efficient industrial-education program.

About one third (34.2 per cent) of the schools have made a recent survey of the community. The schools which offer vocational work are, as would be expected, more active in making surveys than the schools which offer only nonvocational courses. Among the vocational schools nearly half (47.2 per cent) reported a recent survey, while among the nonvocational schools less than a fourth (23.2 per cent) have conducted a recent survey. The results of the survey could be used according to the schools, in five principal ways, listed in order of descending frequency or mention: (1) In giving guidance to pupils in selecting their fields of training; (2) in encouraging enrollment in vocational courses; (3) in the organization of new vocational courses; (4) in purchasing new equipment for vocational courses; and (5) in modifying standards of attainment in courses involving technical skill.

The schools are nearly unanimous (88.9 per cent) in claiming that a survey would aid in guiding pupils into the best type of vocational training. This does not, however, agree with the present practice used in admitting pupils to the unit-shop courses previously reported.

Placement Service

The placement service is one of the final steps in the guidance process. Such a service is provided for all pupils in 37.9 per cent of the schools. A placement service is provided in 83.3 per cent of the schools with vocational offerings and in less than 23.3 per cent of the schools which have only a nonvocational program. One quarter of the schools maintain both a school and a department placement service.

A successful placement program entails follow-up studies, which are performed by 41.8 per cent of the schools. The period of follow-up varies greatly from none to continuously or indefinitely. Nearly half (46.2 per cent) of the schools which attempted a follow-up program have set up a system whereby they can keep permanent records on their graduates.

The follow-up program is carried on much more extensively among pupils who go into industry than among pupils who continue their education. Of the schools reporting that they followed their graduates who went into industry, less than half followed those graduates who continued education in a higher institution.

In the schools represented in this study the median number of pupils who go to college is 25 per cent of those who graduate. However, this may well be too liberal as the methods used by a large number of schools to determine those who go to college is simply to record the pupils who ask for transcripts of credits, as having gone to college. The schools report that those who go on to college from the vocational program constitutes, in all but one school, less than 10 per cent of such graduates, the median being about 5 per cent, while the median percentage who go to college from among the nonvocational industrial-arts graduates is 10. It will be noted that the industrial-education graduates are going on to school much less frequently than the all school average. This does not mean that industrial-education graduates do not receive more formal training after leaving high school. The attitude which the high school takes on the matter of further training in institutions of college grade may well influence the pupils. In nearly three-fourths of the schools offering vocational courses the pupils are encouraged to continue their formal education.

As only a small number of vocational graduates continue their education in institutions of higher education they seek employment upon graduation. The schools report that from a quarter to nearly all of their vocational graduates secured positions, the median figure being about 80 per cent. The graduating pupils from the nonvocational program showed wide variation as to the number who secured work. The median for the schools offering this type of work was about 50 per cent of the pupils securing positions.

This placement record includes all types of positions which the graduates are able to secure. To clarify the situation it is interesting to note that about 40 per cent of these pupils secured placement in occupations for which they had received specific vocational training. The median figure for the graduates of the school year 1936–37 who one year later were working in trades for which they had received specific training, was likewise about 40 per cent.

In organizing a school program there is the problem of planning for those who will finally graduate and of planning for those who drop out before graduation. In the 57 schools reporting, about one third of the pupils who entered the first year did not graduate. This has definite significance if the schools are going to serve all those who come to its doors. Those who fail to graduate are going to find it more difficult to secure employment than those who complete the course. It has been pointed out that industry is increasing its educational requirements.[4] Such a mortality provides a real challenge, an opportunity for cooperative effort on the part of all who serve these youth.

Teacher Preparation and Industrial Experience

This study did not attempt to determine the quality of teacher training nor the effectiveness of the teacher's work on the job, two factors which need to be considered before making any final judgment. This study was only able to collect data on the present status of the teachers as to formal training and industrial experience.

Of the 652 teachers of industrial education reported in 75 schools, about seven tenths have a college degree, and nearly one third have had at least 5 years' training in industry. Of the teachers with college degrees about 14 per cent have the master's degree. The individual schools show wide variation in teacher preparation and experience. One school has no teachers with more than 2 years' academic training, while two schools have no teacher without a master's degree, although in both situations the teachers have not had 5 years of industrial experience. In one school all of the teachers have a college degree and at least 5 years' industrial experience.

Considering the schools as a group, one fifth have some teachers with less than 2 years of academic training, while 97.3 per cent of the schools have some teachers with a college degree. In 54.6 per cent of the schools more than one half of the industrial education staff has a bachelor's degree. In two thirds of the schools, there are some teachers with at least 5 years' trade experience, while in about half of the schools less than half of the staff have had 5 years' trade experience.

[4] C. H. Judd, *Problems of Education in the United States*, p. 16 (New York: McGraw-Hill Book Co., 1933).

SOMETHING GOOD ABOUT YOU

Wouldn't this world be better
If folks we meet would say,
I know something good about you,
And then treat us that way?
Wouldn't it be fine and dandy
If each handclasp warm and true,
Carried with it this assurance,
I know something good about you?
Wouldn't we be lots more happy
If the good that's in us all
Were the only thing about us
That folks bothered to recall?
Wouldn't life be lots more happy
If we praised the good we see?
For there's such a lot of goodness
In the worst of you and me.
Wouldn't it be nice to practice
That fine way of thinking, too?
For you know something good about me.
And I know something good about you.

— *The Grapevine*

The Association calls attention to the professional obligation of each teacher in every department of the school to participate in the guidance functions of teaching, to the end that the public schools shall more effectively perform their major objective of preparing our future citizens to function intelligently, altruistically, and patriotically, in our American democracy. — *Pennsylvania State Education Association.*

Publishing and Printing

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NEWSPAPER PUBLISHING

Newspaper organizations differ from the usual commercial plant. This is true because a newspaper is standardized, while in commercial printing plants each job is custom built, so to speak. Large newspapers are usually incorporated companies, because of the great investment of money, which often runs into the millions of dollars. The governing officials of such a corporation need not necessarily be active in its management, nor are they necessarily publishers or printers. On the small weekly newspaper, however, the entire job of the editorial department, business and printing may be done by one man, who perhaps is the sole owner of the enterprise.

The daily newspapers listed in the tables below are from the *Editor and Publisher*. The weekly newspaper list is from the *World Almanac*, which quotes United States Census figures.

Daily Newspapers, 1938

	Number	*Circulation*
Morning	398	15,107,981
Evening	1,538	24,463,858
Totals	1,936	39,571,839

Newspapers Other than Dailies, 1935

	Number	*Circulation*
Weeklies	5,337	15,284,366
Semi-Weeklies	359	3,852,640
Tri-Weeklies	44	142,928
Totals	5,740	19,279,934

This unit will present that information which should be mastered by the publishing and printing student. Each position in publishing houses will be discussed.

Editorial Staff

1. *Publisher.* Often the publisher is an officer in the newspaper publishing corporation, although sometimes he is not. In some cases, the publisher is the sole owner, or at least in control of company stock. There are no standard duties for newspaper publishers. In general, he may have duties more or less in the following areas: (*a*) Dictate the broad, general policies of the paper. (*b*) Act as co-ordinator of all departments. (*c*) Harmonize the work and the personalities of the editor and the managing editor.

2. *Editor.* As in the case of the publisher, the editor's duties vary greatly. He may or may not have a financial interest in the paper, or he may, indeed, be the sole owner and proprietor. He may attend to some of the duties usually done by the publisher, or he may carry out the broad phases of the publisher's policy. On the whole, however, he may have more or less of the following duties: (*a*) Direct policy in general. (*b*) Direct campaigns. (*c*) Direct promotional plans for good will. (*d*) Control the editorial-page writers, and perhaps do some of the editorial writing. (*e*) Contact the public, and be interviewed by those having plans to promote, pleas to make, movements to publicize, champion causes, and having criticisms to make. The editor must "keep his fingers on the public pulse." He must make speeches, and be active on civic committees, and community projects.

3. *Managing Editor.* Here again duties are not clear cut, varying in most newspaper offices. Usually, however, he has the following work to do, some of which he deputizes others to do: (*a*) Take charge of all news presentation in all editions. (*b*) Hire and fire reporters, and take charge of the pay roll. (*c*) Be on the lookout for possible cases of libel, and keep good taste in things published. (*d*) Make all arrangements for news gathering and editing. (*e*) Supervise those in charge of reporters. (*f*) Determine the lead story on page one, or supervise those who will do the work. (*g*) Attend to news detail in general — deadlines, operating, etc. (*h*) Check other papers for ideas and for comparison with his own.

4. *City Editor.* The city editor is usually shown as the most harassed man in the newspaper movies. His duties, actually, are to: (*a*) Take charge of the copy desk. (*b*) Determine beats for reporters and photographers. (*c*) Direct the art staff. (*d*) Direct the rewrite staff. (*e*) Read reporter's copy, and give constructive criticism of their work.

5. *News Editor.* On large metropolitan dailies, the executives of the editorial department may have a number of assistants. He has a wide variation in duties, and no definite position. He may be working under the managing editor and over the city editor and copy desk. He may have one or more of the following duties: (*a*) Take charge of the copy desk. (*b*) Direct make-up of the pages. (*c*) Edit telegraph, state, and local news. (*d*) Act as assistant to the managing editor.

6. *Associate Editor.* The duties of the associate editor usually concern the editorial page and feature section of the newspaper. He may direct others and even write some of the material himself.

7. *Sunday Editor.* The Sunday editor is usually in charge of the features, picture sections, and items run in that edition of the paper. The regular news is handled by the weekday writers.

8. *Department Editors.* Large city dailies have a number of special editors who handle work of a specialized nature. These men and women take care of: (*a*) Art news. (*b*) Club news. (*c*) Drama news. (*d*) Features. (*e*) Farm news. (*f*) *Make-up.* (*g*) Market news. (*h*) Movie news. (*i*) Music news. (*j*) Review of books. (*k*) Society news. (*l*) Sport news.

9. *State Editor.* Many newspapers have a circulation territory covering an entire state. The man in charge of the many state correspondents is called the state editor. His duties are to handle their news, make up the pay roll, etc.

10. *Telegraph Editor.* The telegraph editor is in charge of the wire news service (AP, UP, etc.) and may take over the duties of the state editor.

11. *Picture Editor.* Some papers, because pictures have become an important part of the modern newspaper, employ a picture editor to select, size, and crop picture material.

12. *Reporters* are classified into various types of jobs, and are directly responsible to the city editor:

a) *General assignment reporters.* These men have no regular news beats, but are on the job in the local newsroom, and do leg work in news gathering. Other duties consist of telephoning to get news material, rewrite any stories previously run, take volunteer news contributions over the telephone, attend to news breaks which cannot be taken by beat reporters, report news from conventions and organization meetings.

b) *Rewrite men.* The rewrites take phoned messages from leg men in the field, rewrite news stories written by others which do not satisfy the city editor, combine several news stories into one, and report new developments in a story from edition to edition.

c) *Beat reporters* cover regularly assigned beats. Usually these beats consist of the city hall, county court house, federal building, and police headquarters. Typical news beats in large cities, such as New York, for example, include Wall Street, ship news, theaters, music, society, state, criminal and city courts, traffic court, radio stations, and the parts of town such as Brooklyn, Harlem, Bronx, East Side, and West Side.

d) *Department reporters'* duties vary with the size of the city in which the paper is published. On large dailies, one or more reporters cover such activities as sports, clubs, radio, theaters, movies, music halls, art showings, churches, Sunday features, and book reviews.

e) *State correspondents* are hired to cover news outside the city in which the paper is circulated, and may work under the direction of the state editor or the city editor. These men are often employed on country weeklies in an editorial capacity. Pay is usually given for space taken by accepted articles.

f) *Staff correspondents* are more or less permanently located in cities where news originates, in order to have news stories that do not come over the wire service. Reporters are located in such cities as Washington, D. C., Rome, Moscow, Berlin, London, and Paris. Some are sent to state capitols during sessions of the legislature.

g) *Bureau correspondents* work on the staffs of enlarged correspondence services. Some large metropolitan newspapers maintain large staffs at Washington, D. C., each man covering some particular phase of the news.

h) *Special writers* take care of particular phases in the news, as politics, science, art, and economics.

i) *News service* reporters gather news for the wire services — such as the Associated Press (AP) and the United Press (UP). Large staffs of these men are located in key cities to work as beat reporters and rewrite men. Some of these from time to time may be sent on roving assignments, in this country and abroad.

13. The *slot man* is head of the "desk," and is responsible for the work of the copyreaders. All editors hand their stories to him, with instructions on how they are to be handled, and the slot man passes them out to the copyreaders, who are ranged around the "rim" of the desk. The desk head, or slot man, receives them back for a last look after they have been edited, and then sends them to the composing room. He may also be the news editor or the telegraph editor.

14. *Copyreader.* This important worker whips stories into shape, catches errors, eliminates the superfluous, and guards against seeming innocent but libelous statements in news columns. He also writes heads for the news stories.

15. *Make-Up Editor.* The make-up editor's importance has been increasing. He takes care of the typography and make-up of the pages for bettering the appearance. He must know typography and type, and make-up. He must make decisions quickly. Often he writes heads, and spends much time in the composing room supervising the work. He may also supervise features and comics.

16. *Business Staff.* As in any large corporation, a sizable group of persons are hired to maintain the business offices of the newspaper. These include:

a) *Business manager,* who attends to all matters pertaining to the operation of the plant and building, the accounts, bills, etc.

b) *Circulation managers* have charge of the distribution of the papers, are in charge of solicitors, substation managers, newsstand representatives, carriers, street salesmen, and mailers.

c) *Advertising managers* have charge of advertising salesmen, any art department conducted for advertisers, and aid in the positioning of advertisements in the pages of the paper.

d) *Advertising salesmen* sell space to merchants and others, and often create layouts and copy for customers.

e) *Auditors, bookkeepers,* and *typists* aid the business manager in his duties.

Mechanical Staff

The printing of a daily newspaper is a specialty job. Newspapers are more or less standardized, but each "job" printed is new each day, and often new with every edition of the day. To print several hundred thousand 48- to 60-page newspapers daily, in several editions, is quite a large printing "order." Many highly skilled and specialized men are employed to do this work:

1. *Mechanical Superintendent.* Chief of the mechanical men is the production superintendent, who may direct the printing of a chain of newspapers or only one. Because of his varied duties, this is the best paid job in the mechanical department of a newspaper. He contacts union officials (when plant is organized) and aids in the determining of wage scales, develops and trains department foremen and workers, conducts studies on hour costs and production, and generally expedites the production of the paper. He is often called a "Production Manager."

2. *Department Foremen* are skilled craftsmen-executives who head the several departments. They are in complete charge of their respective departments, and directly under the supervision of the production manager. They are the:

(*a*) Composing-room foreman. (*b*) Pressroom foreman. (*c*) Stereotype-room foreman. (*d*) Engraving-room foreman.

3. *Ad Foreman* may be the mark-up man at the same time, and is expected to lay out the advertisements so that they can be set with dispatch.

4. *Copy Cutter* may work on ads or on news matter. His job is to see that the entire news stories or advertisements are broken up so that several men may work on them at the same time, thus cutting down the composition time.

5. *News Machine Operator* operates the keyboards of the Linotypes, Intertypes, or Linographs on straight column matter.

6. *Ad and Head Machine Operators* compose the great bulk of type matter for advertisements on the multiple-magazine line-casting machines.

7. *Monotype Caster* operates the machines which make single types in large sizes to be composed by hand for heads and advertisements.

8. *Ad Compositors* assemble the advertisements from slug and hand-set lines, to make them ready for the page form.

9. *Machinists* care for the many type-casting and line-casting machines in the plant of the composing room. It is their responsibility to see that all machines are in good working order.

10. *Ludlow Operators* and *A-P-L Operators* cast advertising display matter and heads.

11. *The Bank Man* assembles each "take" cast up by the operators into complete stories, and gets them ready for the make-up man.

12. *Make-Up Men.* Under the direction of one of their superiors, the make-up men assemble the ads, news stories and cuts into the page forms.

13. *Proofreaders* read prints for errors on ad and news matter. In some plants they are assisted by *copyholders.*

14. *Engravers* make line etchings and half tones for news stories and advertisements.

15. *Pressmen* operate the mammoth rotary-web presses.

16. *Stereotypers* cast printing plates for news pictures and advertisements, as well as feature material and curved stereotypes used for printing the paper on the large rotary presses.

17. *Photographers* furnish the news pictures and feature illustrations for the paper. They work with the reporters, usually.

18. *Mailers* wrap, bundle, and address papers for local and outside distribution.

Average Hourly Rate for Printers in Principal United States Cities, 1938[1]

	Day		*Night*	
	Hours	*Rate*	*Hours*	*Rate*
Typographical	38.5	1.252	38.5	1.331
Pressmen	39.9	1.102	38.1	1.186
Stereotypers	41.9	1.126	40.9	1.204
Photoengravers ...	39.9	1.404	39.0	1.559
Mailers	40.0	.941	39.0	1.007

19. *Second-Class Postage.* Most of the newspapers and periodicals have their publications entered in their city post offices under the second-class postage rate. These may be entered, provided they are published from a known office at regular intervals, numbered consecutively, bearing the date of issue and annual subscription price, and with a legitimate list of subscribers and "if designed for the dissemination of information of a public character."

Second-class rates follow: For newspapers issued more than once a week, regardless of weight, one cent per copy. For periodicals, issued less often than once a week, one cent per copy under two ounces, and two cents per copy over two ounces. Weeklies, local delivery, one cent per pound if delivered in the same county as the publication town. Free circulation and all-advertisements papers, or publications bound as a book, must take third- or fourth-class rate. Not for local delivery, the rate is 1½ cents per pound for nonadvertising parts in postal zones one and two; two cents for zone 4, four cents for zone 5, five cents for zone 6, six cents in zone 7, and seven cents in zone 8. When any advertising does not exceed 5 per cent, the rate is 1½ cents per pound in any and all zones.

When the weight does not exceed one pound for one edition, the rate is one cent for one pound.

Applicants for second-class mail must fill out Form 3501, and pay a fee of $25 for circulations up to 2,000, $50 for circula-

[1]International Yearbook Number, *Editor and Publisher* January 28, 1939, p. 118.

tions from 2001 to 5,000, and $100 for circulations over 5001. Two copies of the most recent issue must be filed with the application. When mailing, one copy is submitted, with marked percentage of advertising and editorial portions. When five or more copies are sent to an individual state or city, they must be marked and tied together.

20. *Manuscripts.* Typewritten or even handwritten manuscripts or copy, accompanying proofs of the same matter, may be mailed under the third-class rate, and the fourth-class rate if over 8 ounces. Proofs may contain handwritten corrections, and instructions for the printer. But, when manuscripts are not accompanied by proofs, they must be mailed under the first-class rate.

Newspaper Publishing Terms

Introduction. Students should become familiar with the parlance of publishing, which is obviously necessary for the success of anyone entering the field, or working with publishers.

Words are given in alphabetical order, and students must use them in their daily work in order to become thoroughly familiar with them.

add — More information to be added at the end of a story written before.
advance — Story given to a newspaper in advance of the time for its release.
agate — 5½-point type, and the unit of measurement for depths of newspaper advertisements. (Inches are used on weeklies, as a rule; agate lines on dailies.)
AP — Associated Press.
art — Drawings, photos, etc., before and after publication.
bank — Section of a headline; and place where type matter is assembled.
banner — Large headline extending across a page; a streamer.
beat — Routine news assignment; an exclusive story printed by a paper ahead of others.
Ben Day pattern — Lines or dots used to tone down blackness of type or cuts.
Bodoni dash — Tapered dash, thicker in center than on ends.
boil — Condense greatly.
boilerplate — News and feature material in the form of stereotypes used by some weekly papers.
box — Material enclosed in rules.
bumped heads — Heads almost the same, placed side by side; tombstone heads.
by-line — Writer's signature on a story.
bulldog — First edition of a morning paper or a Sunday issue.
bulletin — Story received too late for writing into lead which would necessitate a new headline; a brief lead to an important news story, as in wire service copy.
canopy head — Three- or four-deck head, with subordinate ones dropping from the extreme left and right of the first deck.
chapel — Group of union mechanical employees.
chaser — Corrections or new matter made up to replace one already on the press.
clip sheet — Syndicated collection of printable copy.
copycutter — One who hands out copy to operators.
cub — A beginner in news work.
cut lines — Identifying lines for illustrations.
column rule — Rule used to separate columns.
crossline — A single line of type occupying the full measure.
cutoff rule — Rule used to separate advertisements, and to separate different news stories.
dead line — Time set for ceasing to accept copy.
deck — *See* bank.
dogwatch — Assignment outside of publishing hours; or late editions after regular staff has gone.
drop — Subordinate bank or deck in a head.
drop-line head — A headline containing two or more lines with second and other lines indented to the right; a stagger or step headline.
dummy — Chart of make-up plan.
ear — Type matter to right and left of the nameplate.
Eos — Wire service line; extraordinary occasion service.
exclusive — Material that other newspapers do not have; used in place of word *scoop*.
file — To transmit a story by wire.
flag — Statement of ownership and principles beneath the name line of the newspaper, usually on editorial page.
flash — Short message on wire service announcing a big story, breaking in on any story being transmitted.
flush — Even with column rule or margin.
folio — Page number.
folo — Follow; story related to a longer story run under a smaller head at the end of the more important story.
format — *See* dummy.
fourth estate — Burke's reference to the reporters' gallery of Parliament.
French rule — *See* Bodoni dash.
fudge — Device that allows slugs or type matter to fit into the cylinder of a newspaper press for printing late bulletins; the space left in the form for late news.
fyi — For your information; used in wire service messages to copy handlers.
handout — Press agent copy.
hanging indention — When first line is full, others indented uniformly at left, as this paragraph.
inverted-pyramid head — First line full, others indented increasingly as they are composed, as here.
Jim Dash — Narrow dash used between headline decks or between items in departmental news.
jump head — Headline over story that has been continued to another page.
kill — Do not use.
layout — Arrangement of art work for news or feature cut.
lead all — Lead containing the general summary, presenting various angles.
leg man — Reporter who covers general assignments and telephones news to office.
lead — First or first several paragraphs of a news story.
leader — Best displayed story on first page.
legend — Explanatory lines under an illustration.
lobster trick — Shift outside publication hours.
logotype — Nameplate of the newspaper, or title line; matrices or type containing several characters.
masthead — *See* flag.
mortise — Opening through an illustration.
must story — Story ordered to be inserted.
make-over — When additions or changes are made on pages for replating.
mat — Matrix on typecasting machine; stereotyper's matrices.
more — Story not complete, more to come, written at the bottom of a piece of copy.
morgue — Reference library of a newspaper.
nameplate — Name of paper, on first page, and at top of the other pages.
obit — Obituary.
opposition — Competing newspapers.
overbanner — Banner head above nameplate.
overline — Type at the top of an illustration.
overset — Type set in excess of newspaper space needs.
patent insides — News and feature material, sometimes ads, already printed and used on some weekly papers.
play up — To emphasize by the heading.
predate — Edition run today with tomorrow's date.
pyramided ads — Advertisements banked to right or left and arranged to a point upward.
query — Wire message asking if story is wanted.
quotes — Quotation marks.
railroad — Rushed, unedited copy; matter not proofread.
readyprint — *See* patent insides.
release — Date news story may be used.
reverse plates — Printing plates reversed photomechanically in black and white.
R. O. — Runover, continued on another page.
running head — Name and date line at top of each page.
sacred cow — Copy which is not to be changed or cut; persons receiving editorial favor.
sidehead — Flush heading.
skyline streamer — Same as over-banner.
slug — Directions for copy for printers, which goes with the type.
spot news — Stories of immediate happenings.
spreadhead — Multiple-deck head containing one or more decks three or four columns, less than full-page width.
stagger head — A drop-line head.
step head — Drop-line head.
stet — Disregard changes in copy.
straight news — A simple, terse style in news stories, with no imaginative touches.
streamer — *See* banner.
string — Newspaper correspondent's clippings sent to paper for pay. A day's work on a slug-casting machine.
sub — Substitute story for one already written up or in type. An extra showing up for work in the mechanical department.
tabloid — Newspaper of small size, usually half of the modern size. Term is now in disrepute.
take — Section of copy given to linotyper.
thirty — 30, end of a story or end of day's work.
tight — Crowded with advertising.
title line — *See* nameplate.
tombstone heads — Bumped heads.
up — United Press wire service.
well make-up — Arrangement of page when ads are left and right, with stories between.
wide open — Newspaper when news space is greater than normal.
widow — Line containing one word, or part of a word, continued to the top of a column.
wire overhead — To send news by commercial wires rather than leased wires of news service.
wooden head — A headline which does not tell the news.

(To be continued)

Cracking the Crust

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The question of how to evaluate the personalities of students, fellow teachers, school administrators, and others with whom dealing must be had, deserves careful study by every teacher who wants to be a success in his profession.

A Common Experience in Life

A rather universal and stimulating experience in life is that of encountering problems possessing varying degrees of difficulty and seeking to break through them to a satisfactory solution. In mathematics there is the *problem*, sometimes too obviously artificial; the drafting room has its construction *problems;* the shop presents *problems* of processes and combinations of processes; and in life outside school the *problems* are so numerous and perplexing as to be well-nigh overwhelming. Even the squirrel has a *problem* to solve every time he seeks to get at the interior of a nut, and his teeth are kept in condition for attacking future ones by dealing summarily with the one in hand.

Sometimes when the problem seems to be particularly difficult or distasteful, there emerges the tendency to evade the issue and seek the easy way. The more intelligent procedure consists in the utilization of one's powers in determining the most advantageous method and point of attack. The hesitancy often arises from a fear that one's strength is insufficient for the task, but even in physical combat it is not always size and avoirdupois which win as much as intelligent tactics.

On a cold winter morning a workman in a foundry yard was assigned the task of breaking up scrap iron with a sledge hammer in order that it might be more conveniently conveyed to the charging floor of the cupola. Among the scrap iron he discovered several hollow iron spheres which were next to impossible to crack even with his heavy hammer. Rather than exerting unnecessary energy upon them or giving up in defeat, he filled them with water and went about his other work while the forces of nature performed the task much more easily than he could have done.

Other vivid illustrations of nature's own methods are present on every hand as winter gives promise of breaking forth into spring. The tender shoot from a seed which may have lain in the ground all winter appears to have insignificant strength and endurance when compared with wood and stone, and even with the earth through which it eventually emerges. Likewise the baby chick, finding himself separated by a crust from the world he is impelled to enter, utilizes the means provided him by nature for accomplishing the necessary cracking.

Everyday Applications

The nutshell, beside constituting a temporary obstacle to the squirrel, serves fundamentally as a protection to the kernel inside which lies the germ of life itself. Similarly the eggshell was not provided to make life more difficult for the chick, but as a necessary protection for the egg.

These crusts, and many others, then have a reason for existence, and the problem becomes one of understanding their nature, and how to cope with them if that becomes necessary. The crust around a loaf of bread serves many a useful purpose. The crust over a drift of snow, and the one covering a treacherous pool of soft mud, present a sort of outward appearance which is exceedingly deceptive, and requires knowledge and forethought on the part of the wayfarer if he is to avoid catastrophe. On April Fool's Day we become suspicious of all confections offered us, because it is impossible to detect any difference between the chocolate shell which covers a cherry and the one that surrounds a piece of soap.

Perhaps the most perplexing crust we commonly encounter is the one which covers or partially disguises human personality. The prospective buyer of insurance, automobiles, liniment, flavoring extracts, shaving cream, vacuum cleaners, or ideas, each is encased in a protective crust which must be inspected and analyzed by the salesman, and some successful means of penetration discovered. The suitor must break down the shell of resistance surrounding the maiden whose favor he seeks in courtship, and perhaps the even more impenetrable crust of her father.

An ambitious daughter of a rather austere man had failed to secure her father's permission and financial support for the college course she wished to pursue. She tried most of the approaches commonly made but to no avail. Finally she prepared a dinner of his most favorite foods, serving it in the most agreeable environment, and succeeded in accomplishing her purpose.

Then there is the child whose confidence we seek, as parents or teachers. The great question which confronts us is how to get through that surface covering of self-protection or defense which so often exists and get at the real child who lies beneath.

The Effectiveness of Understanding

The barriers between the child and the adult, whether he be teacher, parent, or anyone else are due almost invariably to lack of understanding, on one side or the other — sometimes both. The most completely successful parents and teachers are those who from the beginning develop a spirit of mutual confidence and understanding. The one who fails to do this finds himself faced frequently with human shells he seeks to shatter with greater force but with less success.

Every student of education has been subjected to more or less extensive contact with the field known as psychology. Briefly stated, psychology attempts to use outward signs as a means of understanding what is going on beneath the surface. In other words it is an attempt to understand the motives which prompt people about us to think and act as they do. In the extent to which we are responsible for directing the thinking and acting of others this sort of applied psychology lays the foundation for intelligent and effective procedure.

Now and then there may be observed the person who tries to live entirely within the protection of his own encasement. Such a person is known as an introvert. The one who lets his own life and personality out to associate more with others finds himself enriched and enlarged thereby. He may be spoken of as an extrovert. The tendency toward introversion on the part of anyone increases the likelihood of barriers growing up between himself and others.

A working knowledge of some of these things is necessary not only in the school, but in the world outside. The steady spread of vocational education confirms the belief that the work of the school must involve a greater element of application, and the world of trade, industry, and business must enlarge and refine its knowledge as well as its practice.

In a publication such as this, devoted alike to education and to the physical equipment by means of which it may be accomplished, it is appropriate that the teacher or other school person might think of this question of intelligent human approach not only in the education of the pupils under his instruction, but also in his relationships which may savor more strongly of administration or business.

The teacher must deal with the superintendent or principal, who in turn must deal with the school board, and all or each in their turn must deal with the manufacturer or his representative. In each case there is a certain amount of resistance to be overcome — a crust to be cracked so to speak. If each of these approaches can be made with honesty and straightforwardness, and the whole procedure based on well-established facts, school business will have been strengthened, and school service will have been enlarged.

Making Paper in the School Print Shop

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Papermaking is another simple activity unit for the secondary-school print shop for course enrichment and self-exploration.

The process of making paper by hand is performed primarily in the same manner today as it was centuries ago by the Chinese. Thus, it makes another excellent hand project for the boys in the print shop. No previous experience is needed before starting this unit; therefore, it can be put anywhere in the course of study.

Any new developments which have taken place in the manufacture of paper, have been principally associated with the production of the pulp, the methods and apparatus used in sizing; that is, making the sheet nonabsorbent to writing ink, and in the finishing of paper. The steps leading up to the actual production of the pulp are identical in procedure, whether the pulp is intended for high-grade machine-made paper or for handmade paper.

The handmade process is generally associated only with the very highest qualities of paper; therefore, scrupulous care is to be exercised in the selection and treatment of all materials used by the boys in this project. Handmade paper, however, can never hope to compete with machine-made paper for everyday uses. The demand for handmade paper lies in its quality, its uniqueness of construction, and in its outstanding attractiveness. The boys have realized a great deal of pleasure out of actually creating a sheet of usable paper.

Early Papermaking Practices

History of Molds. Practically all of the paper made in Europe up to the early nineteenth century was formed in hand molds. The original Chinese paper, made about A.D. 105, was also formed in a mold of bamboo framework. Fine woven cloth was used as a screen. This cloth was sufficiently open to permit excess water to drain through it and still fine enough to retain the paper fibers.

A mortar and pestle, manipulated by hand, was the first method used in beating the bark into a fibrous substance. After adding water, the continuous pounding finally rendered the pulp into small separate fibers. The mass was then placed in a large tub partly filled with water and stirred freely. The mold was next dipped into the tub, or vat. By raising the mold slowly, and with a forward, backward, and side motion, sufficient fibers were collected on the cloth while the water drained through. Thus, a sheet of matted fibers was collected.

The early Chinese papermakers allowed the wet sheet to remain on the cloth until dry. A Persian invented a method of removing the wet sheet by means of a rolling bamboo covering as a mold. This mold was built similar to an old-fashioned porch shade. The covering and the wet sheet were removed from the frame, and with a rolling motion, the fibrous pulp was deposited upon large boards to dry. The mold and bamboo cover could then be used continuously.

Europeans used a mold made of wood and metal wire screening. Up to the present time, the hand fabrication of paper is still carried on in much the same manner as that of the original Chinese method.

With the invention of movable type about 1450, the demand for paper for printing purposes was tremendous. Thousands of paper mills were in operation by the eighteenth century, but still they could not supply the great demand for more and more paper. Many men tried unsuccessfully to invent and develop a papermaking machine. It was not until 1808, however, that Henry and Sealy Fourdrinier perfected the original invention of Nicolas-Louis Robert. Other improvements soon followed, including the drying cylinders and the calender rollers.

Most of the paper that the average person sees in the form of books, newspapers, pulp magazines, circulars, and cheap writing papers, is composed chiefly of wood fibers. Only the finest paper contains rag material. Rag paper is used in the making of paper money, expensive stationery, fine ledger and book papers, and for fine cover papers.

It is impossible to describe all the technical details necessary in the commercial production of handmade paper. Therefore, this discussion will be limited to the making of paper in the school print shop with the materials and equipment procurable by the instructor.

Handmade Paper in the Classroom

Preparing the Pulp. Several schools use small beaters for the purpose of macerating rags or wood chips into material suited for papermaking. These beaters are of the type used in the laboratories of commercial paper mills for experimental purposes. The miniature beaters mentioned above may be purchased from several sources[1] at a nominal price, but are not imperative to the success of the project. If an electric potato mixer is available in the school cafeteria, it will serve very well in the place of the commercial beater.

Another substitute consists of a small tub with a close-fitting cover. A wire-paddle arrangement, made to fit in a drill press and allowed to revolve in the tub, will serve to get the pulp macerated. Both of these substitutes for regular beaters have produced fine results.

Macerating Rags for Pulp. Rag-content paper may be produced in the shop by macerating white cloth with the use of an old-fashioned meat grinder. Long, well-drawn out fibers should be produced in order to obtain the strongest and finest paper. Nevertheless, more satisfactory results have been accomplished with bleached dried pulp secured from a neighborhood paper mill. This means, of course, that the students will not be given as clear an insight into the purpose and process of maceration as when starting with cloth or wood chips.

Beating the Pulp. Just as in the converting mill, the dried pulp is placed in the beater half filled with water, to be beaten and hydrated. The amount of material to be beaten at one time depends upon the capacity of the beater tubs. If a regular beater is not available and the potato masher or drill press is used instead, tear the sheet of dried pulp into small bits and let it soak for about 48 hours in a large earthenware jar half filled with hot water. The bits of pulp should be torn as small as possible and stirred in the hot water with a paddle for at least an hour. This tends to loosen the fibers of the pulp. The material now is ready for the beating process.

The beater tub should be partly filled with warm water. Enough hydrated pulp should be placed in the tub to fill it about two thirds. The length of time that the pulp remains in the beater is determined by the even and homogeneous appearance of the pulpy mass. This operation may take from two to four hours. A good test is to place a small quantity of the mass in a bowl of water. Stir it and see whether or not the individual fibers float evenly, and if they are of the same length. Should lumps and knots appear, the material has not been beaten sufficiently, as these particles would appear in the finished sheet.

There is an old saying among papermakers that *paper is made in the beater,* meaning that the beating process is the most important single step in the entire fabrication of papermaking. The prepared paper pulp may be stored in large earthen ware covered jars with sufficient water to keep it from matting. It should be stirred a few minutes every day while being kept in this state.

[1]Downingtown Manufacturing Company, Downingtown, Pa., or from large paper manufacturing concerns.

Sizing of the Paper. If the paper, which the boys are preparing, is to be used for writing, it must be properly sized, as only by this process will it become impervious to writing ink. Sizing is manufactured commercially from hides of animals, refuse from tanneries comprising hoofs, horns, bones, and clippings of hides. Constant heating and treating converts this into a fatty gelatine. By filtering, the impurities are removed. Alum is added to condition this solution and help give it the necessary character of resistance.

On the other hand, if powdered sizing or gelatine is purchased, it should be boiled in water to form a thin liquid solution. About 10 per cent of alum is added. This prepared sizing may be added to the tub of pulp where the sheets are made. If the sizing is kept as a separate operation, the almost dried sheets are dipped in this solution while it is still warm.

Paper that is intended for letter press or for block printing, need not be sized, as printing ink will not spread or blot.

Coloring of Pulp. Any pigment used in coloring fabrics may be used in coloring paper. It can be accomplished by placing the pigment crystals in a small white cloth bag and dipping it into a vat of pulp. The contents are stirred until the coloring shows throughout the mass. The dye may, however, be added to the beater during the beating process. No particles or pigment crystals should be permitted to escape into the vats; otherwise blotches of color will appear in the finished product.

The coloring of paper may be used as an entirely separate operation by the use of various methods. When the sheet of paper is fairly dry, it can be passed through a solution of colored dye and water; it can be sprayed with a toothbrush dipped in dyed solution; or it can be spotted with other colored fibers. Many new combinations of colors can be obtained with a little experimenting.

Watermarking. Watermarking is a process of forming lettering or designs in the paper when it is being made. The designs for both lettering and shaded markings are made up of copper wire by hand, usually in many small pieces. In the case of the letter marks, they are sewed or soldered onto the wire screen of the mold for handmade paper, and on a large cylindrical *dandy roll* for machine-made paper.

In the case of the shaded design, the wires are first soldered onto a plate from which a die is made. This die is then impressed into the screen, making high and low places. Therefore, it is possible to make thin places in the paper with the lettering or design on top of the wire screen, or make thick places by countersinking or pressing a design into the screen causing more pulp to form in the crevices.

The Mold and Deckle. The molds and deckles that are made for commercial handmade paper mills are generally made by their own employees. It is extremely accurate work and requires an excellent knowledge of materials as well as expert skill. The wood must be of high quality and well seasoned, due to the fact that the molds and deckles are being constantly submerged in warm water.

There are no known concerns in the United States making wood molds for handmade paper. However, it is possible to purchase aluminum molds similar to those used in machine-made paper mills for the testing of fibers. The William Apparatus Company, Watertown, N. Y., sells aluminum molds and deckles in two sizes; one is 8 by 8 in., making a sheet 6¾ in. square, costing $25 per set; and the other is 10 by 12 in. for $45. The molds are supplied with No. 14 backing wire and 80-mesh square-weave wire.

Of course the purchasing of this aluminum mold is not a necessity to the success of a project in papermaking in the shop. It is helpful, however, in completing the steps in the process. But there is no reason why the making of one's own tools is not more helpful and desirable.

Preparing the Papermaking Tools

The Mold and Deckle. The principal tools used in handmade paper are the mold and deckle. The mold is used to collect the fibrous material from the vat, or tub, into sheets of an even size and thickness. They are shaped similarly to a wooden picture frame. The upper side being covered with rustproof woven wire or laid wire. The No. 16 wire screen is tacked on first and the No. 40 screen placed on top. This double screen will retain the fibers and still permit water to drain through.

Frames are generally made of well-seasoned mahogany, walnut, or maple, because these woods have less warpage than others when subjected to dampness. Angle irons are screwed onto the bottom of the frame to prevent warpage. Running across the rectangular mold, from one long side to the other, are wooden ribs to keep the screen level. The tops of the ribs are flush with the top of the mold and are about ¼ in. thick and 1½ in. apart. They are wedged and glued into the cut-out places of the side pieces. A double piece of No. 18 wire is woven crisscross through the ribs to brace them, although this is not necessary if well constructed. Small molds may not need more than two or three ribs and no crisscross wire.

The deckle is a frame that fits over the edges of the mold and acts as a fence. It keeps the pulp within bounds, determining the size of the sheet to be made. The deckle has very little to do with the thickness of the paper formed, however. It should fit the mold well and slip off and on easily. Large frames may need handles to assist in removing and replacing. A double coat of waterproof varnish on all wooden apparatus will help, of course, to preserve them.

The Paddle. The paddle is used to stir the pulp, enabling the individual fibers to become separated and float in the water. Holes bored in the paddle will assist in the stirring. The fibers must be suspended throughout the entire water before the mold and deckle is dipped into the tub. If the pulp is permitted to remain any great length of time without being stirred, the fibers will become matted and the solution will have to be beaten again. It is a good practice to stir the pulp for about fifteen minutes each day when it is not being used.

The Rocker. The *rocker* is an imitation of a desk blotter, although much heavier. It is used to squeeze out the excess water from the newly formed sheets. After the fibers have been collected on the mold, the deckle is removed and a piece of felt is placed on top of the matted mass. The rocker is then used to squeeze the excess water. A heavy rolling pin may be used if a rocker cannot be made.

The Felts. The *felts* used on the machine in the commercial paper mills are made from the best bleached woven material obtainable. They are made to stand hard wear and rough usage. A new felt is needed every four or five weeks. They would wear much longer, of course, in the print shop where the usage is slight and less frequent.

For school purposes, however, a bleached woven roller felt ⅛ in. thick, may be used. Felts may be secured from the Felt Products Manufacturing Company, Chicago. The cost varies with the kind of felt needed, ranging in price from $1.25 to $4.50 per square yard. When the felts are cut to size they should be a little longer than the sheet of paper to be made.

Charts and Pictures. For this unit on papermaking many illustrative charts and picture materials on how machine-made paper is made, can be had for the asking.[2] The paper mill in your community will be glad to cooperate in developing a unit on papermaking.

Making Paper in the Classroom

In the previous paragraphs the practices and materials have been discussed rather fully. Following logically are the procedures in the order of their execution by the boys in preparing handmade paper.

First, it is necessary to have the equipment and materials set up and close at hand. Have the old-fashioned hand wringer or bookbinder's press, the galvanized-iron tub, the felts, the rocker, the mold and deckle, the chip boards and pressboards, the table, and the iron hot and ready for work.

Be sure that sufficient pulp, coloring, and sizing have been added to the tub half filled with warm water. The density of the solution determines the thickness of the formed sheet of paper.

Stir the solution for a few minutes un-

[2]Write to The American Writing Paper Company, Inc., Holyoke, Mass.; The Kalamazoo Vegetable Parchment Company, Parchment, Mich.; and the Hammermill Paper Company, Erie, Pa.

til the individual fibers become separated and float evenly throughout the vat, or tub.

The mold with the deckle in place is now dipped perpendicularly into the tub. When it is well under the surface, turn the mold and make it level before raising it out of the solution. Now bring the mold and deckle to the surface filled with the macerated fibers. As the mold is lifted carefully, it is slowly shaken, first from left to right, then forward and backward. This action crosses and mats the fibers while also causing a tendency to expel some of the water through the wire screen. The mold and deckle are now lifted free from the tub, the fibers concentrating on its wire surface.

Now that the sheet has been formed, tilt the mold with the deckle in place, so that the surplus water drains from one corner, leaving the wet sheet flat and undisturbed. Place the paddle with which the solution was stirred, across one corner of the tub and rest the mold and deckle on the paddle and edge of tub.

FIG. 1

FIG. 2

FIG. 3 FIG. 4

Fig. 1. Deckle, mold (front and back view), rocker, electric iron, paddle. Fig. 2. Stirring the pulp in the tub or vat. Fig. 3. Collecting the fiber in the mold and deckle. Fig. 4. Removing the deckle from the mold. Fig. 5. Removing sheet of pulp and felt from mold. Watermark A is visible on mold. Fig. 6.

FIG. 5 FIG. 6

FIG. 7

FIG. 8 FIG. 9

Felt placed on top of fibrous sheet. Rocker used to press part of water from sheet. Fig. 7. Pressing the sheet, sandwiched between two felts, through the wringer. Fig. 8. Drying the sheet and giving it a smooth finish with an electric iron. Fig. 9. The finished sheet of paper

The deckle, or fence, is next removed which leaves the matted fibers formed squarely around the four edges of the mold. Place a felt on the moist sheet and with a rocking motion, use the rocker over the entire surface. After the sheet has been drained sufficiently, the newly formed paper is ready to *couch*.[3]

Move the mold, wet sheet, and felt to the table or bench and the sheet of paper is ready for the next step. Lift one edge of the sheet and felt slowly and gently. With a rolling motion remove the wet sheet onto the felt. Lay this down and place another felt on the exposed side of the sheet. Next, adjust the rollers of the wringer to accommodate the sheet, which is sandwiched between two felts, and press it through. Tighten the rollers and repeat the operation until the sheet of paper is well matted down.

Now remove the paper and place it between two heavy pieces of chip-board paper. Tighten the wringer rollers still more and run the chip board and paper *sandwich* through until the sheet is fairly dry.

[3]*Couch* or *couche*, is the French word *to lie down*. The term *deckle* is derived from the German word *deckel*, or from the Dutch word *dekfel*, meaning to cover.

Repeat the last operation with heavy pressboard. This adds smoothness to the freshly made piece of paper. If a bookbinder's press is used instead of a hand wringer, stack a pile of felts and paper, about ten sets together, in the press and tighten as hard as possible. Replace the felts with pieces of heavy chip board and again tighten the press. Repeat the last operation but use heavy pressboard this time.

To obtain a still smoother finish, use an electric or hot hand iron over the sheet of paper. Other finishes can be obtained by placing the newly formed paper between sheets of various kinds of cloth with sheets of zinc. The stack of about eight sets is then submitted to heavy pressure.

The sheets of paper may then be trimmed to size, although the deckled edges formed by this process add to its unique appearance.

Summary

It is hoped that this unit on papermaking will aid other instructors in providing an opportunity for their boys in the print shop to have a better understanding and comprehension of the craft of papermaking. A great deal of pleasure, as well as insight, can be derived by the students in making paper, setting up type, and printing something of his own on it. Some of the boys have gone so far as to make wall plaques by framing their finest pieces.

As a teaching device this unit not only provides for individual differences and variety in the shop activities, but has many educational values also for all who continue in this interesting field of papermaking. Papermaking, then, is another simple and inexpensive activity for the school print shop that has proved its merits.

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Printing Education in Quebec

A. V. Mackenzie

Montreal, Canada

A description of the printing course offered at the Montreal Technical School at Montreal, Canada.

The progress and achievement of the printing department of Montreal Technical School are aptly epitomized in the occurrence of two widely separated incidents and the space of time intervening. Thirteen years ago, at the incidence of the Department, so lightly was technical education held — or so little understood — that a Montreal printer desiring a new apprentice, stated in his advertisement that no technical-school student would be considered for the job.

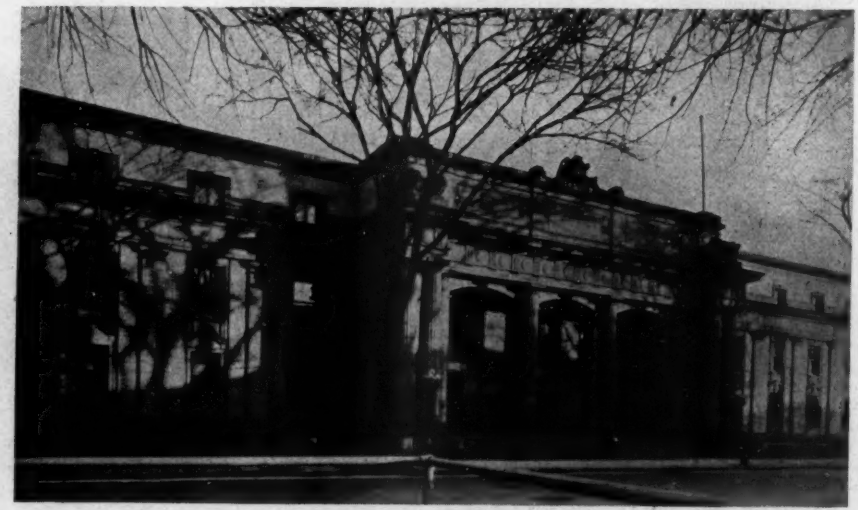
Today, the superintendent of the Department displays from the condensed ad columns of a current daily, an advertisement for an apprentice, stating that a technical-school graduate will be given preference in applying for the job.

Ever since a witty musician dubbed technique the art of playing the simplest composition with the utmost difficulty, there has been in some quarters a certain vagueness as to the word's implications.

"Some people have an odd notion concerning a technical school for printing," declares Ian McLeish, B.Sc., E.E., assistant principal, Montreal Technical School and editor of the school monthly *Technique*. "They visualize a course of this kind as nothing more or less than fiddling with a lot of type material and monkeying around a few machines. You put some blank papers in at one end of the machine and out comes the printed material at the other, and there you are.

"They get quite a shock when they learn that to enter a good printing school they must have first a good knowledge of English, composition, and spelling; that they must have attended a high school for a couple of years at least before they are in any way prepared to follow the regular printing classes. To become a competent technical printer there are many things to learn beside typesetting.

"The technical printer is expected to become in time a real craftsman and not merely a rule-of-thumb artist. He must take time to study English and become a first-class speller. He should acquire a good knowledge of drafting, both freehand and instrumental, and have a good working



Montreal Technical School

knowledge of at least elementary mathematics.

"He is required to study color harmony, as well as the laying out of different classes of work such as advertising announcements, in fact to do all the display work a real craftsman is required to perform. He learns how to estimate costs, how to organize and run a printing plant and to get the work out in the most efficient manner possible. There is a great deal more to being a technical printer than mere handling of type, and at the Montreal Technical School we impress upon our students that to make a real success of their work, to become real craftsmen, they must develop many sides of character and training."

Obviously, then, the idea is not to give students a mere smattering of the printer's trade, but to get down to fundamentals, so that each student may learn from the start the reason and meaning for every step he takes.

The Montreal Technical School, whose pretentious buildings of sand-colored brick and sandstone facings occupy practically an entire block, was founded by the Quebec government in 1907. At present under the principalship of Hector F. Beaupré, B.Sc., CH.I., the school has attained a creditable measure of much more than local fame, by reason of the excellent standards maintained in its work.

Building equipment is commodious and adequate. The ground floor contains administrative offices and waiting rooms — and a museum where are exhibited permanently many specimens of work done by pupils. At the ground-floor level, there are a series of classrooms forming a quadrangle around a large graded semicircular amphitheater with a seating capacity of six hundred.

All sections of the buildings offer ideal study conditions from the standpoint of comfort and hygiene. Classrooms are large and well lighted. Ventilation is always adequate. Pupils have at their disposal admirable rest rooms, toilets, and shower baths. They may use as freely as they wish the school's fine technical library and reading rooms, and there is a commodious and comfortable students' dining room.

Against this general background, the printing department was established in 1925. Under the joint supervision of Frank Rhodes and Fernand Caillet, a preliminary class of fourteen students was enrolled. Under this coleadership the department proceeded with its development until Mr. Rhodes' death in 1932. Mr. Caillet, recently deceased, was wont to refer feelingly to the loss the school sustained in Mr. Rhodes' passing and paid tribute warmly and generously to the latter's qualities as man, teacher, and co-worker.

Léon Pillière, who is now in charge, possesses notably that so-desirable quality in teachers, enthusiasm. Referring to the yellowed newspaper advertisement, of which mention was made at the beginning of this article, he says: "They didn't want us then! but it is different now. We have a capacity for thirty-six students, and we turn down many applications every year because we lack accommodations. And of course there is this from a recent paper!" He smiles now as the clipped want ad accords his school the credit for which his predecessors worked hard a dozen years and more.

Composing Room, Printing Department

Mr. Caillet and his confrere Frank Rhodes topped a list of upwards of a score of competitors who faced gruelling theoretical and practical tests that dozen years ago, aimed at selection of the best men available as teachers. Associated with the present director as assistants are two teachers, James Gahan and Roch Lefebvre, the former a contributor of many informational articles (in English) on printing to the school publication *Technique*. There are, too, other teachers who handle such branches as grammar, arithmetic, and drawing instruction. Attached to the department also is a compositor, a pressman, and a bookbinder for the monthly getting out of *Technique*.

In establishing its printing department, Montreal Technical School knew it had prejudice to battle with, and educational ground-work to do. Quality was set as the objective. There has never been any intention of flooding the local industry with graduates beyond the absorption point. Total graduates of the printing department, after fourteen years' work, number less than a couple of hundred. The equipment in use in the department has cost less than the modest figure of $50,000.

Fruition has come in further recognition of the standing of Montreal Technical School printing graduates, in that the joint committee administering the printing industry in Montreal territory under the Quebec Collective Labor Agreements Act, now gives such graduates a two-year credit against its apprenticeship requirement of six years. Credit of first year is given at once on a graduate concluding indenture as an apprentice, and the final year is credited when the end of the fourth year is reached. Two years in school and four as apprentice thus covers the six years' requirement.

The school year consists of two terms: beginning of September to middle of January; and middle of January to middle of June.

Applicants must be at least fourteen years of age, vaccinated, and present a birth certificate or a naturalization certificate when such is required. For the printing course which covers two years, only those who have finished at least two years at high school or its equivalent are admitted to the entrance examination. Classes

Printing Department

are held daily except Saturday and Sunday, from 9 a.m. to 4:30 p.m., with lunch hour 12 noon to 1:30 p.m.

All practical work is supplemented in the department by lessons in related theoretical subjects. Such academic subjects include English, French, arithmetic, drawing, history of typography, all based on the printing trade. Pupils are required to execute a series of typographical exercises which have been well graded and studied in advance. These exercises are then printed so that each apprentice can see for himself the results he would have obtained in a regular printing shop. Tuition fees covering the two-year course consist of a registration fee of $7 payable at enrollment, $30 for the first year, payable in ten equal monthly installments of $3, and $40 for the second year, payable in ten equal monthly installments of $4. There is, too, a provision for free tuition for those unable to pay the regular fees. Application is made to the board for this at the time of enrollment.

The Montreal Technical School takes pains to make it clear that evening classes can in only a limited measure take the place of the regular day sessions.

Inasmuch however as it is recognized that evening classes may provide something of scientific and practical training for apprentices, journeymen, and others engaged in industrial or commercial pursuits during the daytime and who desire supplementary instruction in application of science and mathematics to their trade, evening classes are offered.

Evening courses commence on the first Tuesday in October at 7:30 o'clock and continue weekly until March. Any applicant sixteen years of age or older, who possesses a primary-school education, is eligible for admission.

A first-year course in composition is conducted on Tuesdays for apprentices having not less than one year's experience. This course covers study of the case and its characters; the point system; justification and spacing; punctuation; proofreaders' corrections; use of italics and of figures; division of words; indentation of poetry, etc.

A second-year course conducted on Wednesday evenings is arranged for apprentices having not less than two years' experience. This deals with book composition specially; history of printing; component parts of a book and their study in detail; casting-off copy; notes on imposition, etc.

A third-year course is conducted on Friday evenings. This is for compositors having three of more years' experience, who have completed successfully the second-year course. This covers harmony of type faces; interpretation of copy; group balance; law of proportion; shape and tone harmony; contrast; business stationery; theory of color, etc.

A first-year course on presses is devoted to a study of the platen press, a natural introduction to the more complicated cylinder press. Tuesday evenings.

A second-year course (Thursdays) covers explanation of the component parts of a press and the way in which they function; different make-ready required for type, electrotypes, engravings (line and halftone), etc.

A third-year course (Fridays) is open only to those who have completed successfully the second-year course. Included in the subjects given is a study of the difficulties that occur on the press, their causes and remedy — and also colored inks (theory and practice), etc.

Each of the six yearly evening courses immediately hereinbefore referred to consists of twenty lessons. They are conducted on the evenings named from 7:30 to 9:30 o'clock.

The Public Schools and Juvenile Delinquency

R. M. Kindred

Director Vocational Education,
Colorado State Industrial School,
Golden, Colorado

A plea to make the school extend its influence beyond the school day in order to reduce delinquency.

Our national public school system has had so many burdens properly belonging to the home shifted to it and has received so much criticism that the writer hesitates to make the suggestions contained herein, which are the outgrowth of his observations during the several years he has worked among, and with, the adolescent, juvenile delinquent boys committed to the State Industrial School for Boys in the State of Colorado. He feels, however, that aided by his experience he may have hit on a clue to the solution of the problem of the prevention of juvenile delinquency which may have some merit and possibly may prove worthy of further study by interested people. The majority of juvenile delinquents are such because of a maladjustment of some sort either in the home, at school with the conventional school subjects, or in the after-school hours, and that, while the public schools obviously cannot do much if anything about poor home conditions, they can do something toward correcting maladjustment of the pupil within the school proper, and probably also remedy to a certain extent some of the conditions that contribute to delinquency after school and in the evening.

To give a better picture of the background of the adolescent delinquent boy, the following presents some figures gathered at random from the records of over a hundred boys who have at one time been inmates of this school. No attempt is made to prove anything by submitting these figures, but the writer wishes to show what is typical of the backgrounds, or lack of background, which the delinquent possesses. In the first place, there is the parental situation or status. In Table I is listed the parental situation of this group of boys. As shown, approximately 60 per cent come from broken homes. This ratio does not vary much from year to year, as repeated checks have shown.

TABLE I. Parental Situation of 121 Boys at Colorado State Industrial School for Boys

Parents living together	49
Parents separated but alive	34
Mother deceased	19
Father deceased	17
Both parents deceased	1
Orphan	1
Total	121

It is hardly necessary to comment on these figures other than to point out that besides this group of 121 boys, there are others on probation in the state, and a similar ratio of broken homes prevails in the probationary group also. Closely tied up with the poor home conditions, broken homes, and, in some cases, no homes at all, are the specific reasons for commitment which are shown in Table II. This throws further light on the delinquency situation.

TABLE II. Reasons for Commitment as Given on the Mittimus Papers of 121 Delinquents Received at Colorado State Industrial School

Stealing merchandise	47
Burglary	33
Running away from home and school	34
Stealing cars (joy rides)	16
Stealing cars (monetary reasons)	3
Incorrigibility	7
Rape or attempted rape	1
Indecent exposure	1
Check writing	1
Unsatisfactory on placement	3
Total	146
Twice counted	25
	121

(Continued on page 10A)

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"Super-heat-treated" head. "Evertite" oil treated handle of selected straight grain hickory. Patented wedges. Five other sizes.

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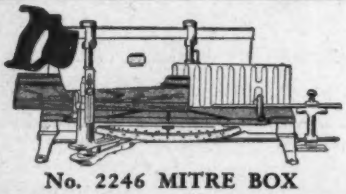

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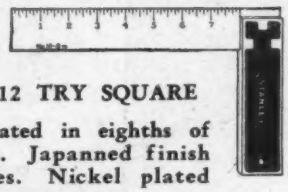

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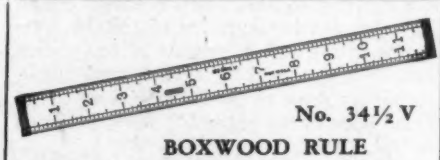

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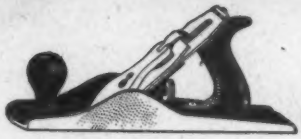

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No. 919 BIT BRACE

Self centering chuck, all parts locked in place. Bronze bushed ball bearing head. Made with 8, 10, 12 and 14 inch sweep.

No. 20 SCREW DRIVER

Standard blade. Blade, shank and head hot forged from one piece of steel.

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SHEET METAL SHOPS

Hammers, Chisels, Punches, etc.

AUTOMOBILE SHOPS

Body and Fender Tools, Hammers, Chisels, Punches, Pliers, Files, Screw Drivers, etc.

MACHINE SHOPS

Hammers, Rules, Chisels, Punches, Levels, etc.

FORGE SHOPS

Anvil Tools, Tongs, Hammers, etc.

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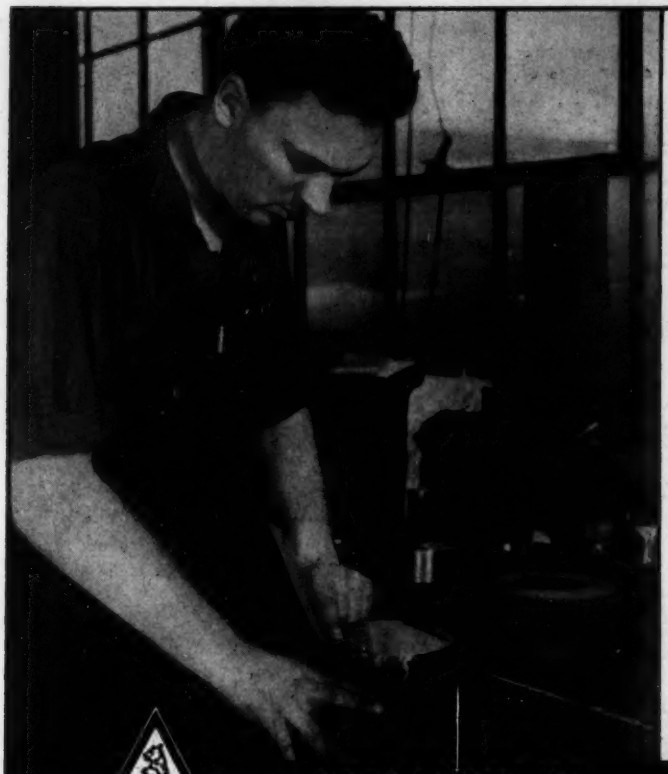

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For use on flexible shaft tools. Excellent for sanding those "hard-to-get-at" places.

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Educational Service Department

(Continued from page 134)

One only has to read between the lines to visualize that much of the petty thievery which so often sends boys to an institution of this kind is impelled by the poor home conditions hinted at in Table I. The running away from home in most cases is closely tied up with a stepfather or stepmother, incompatibility, the unfair treatment of children by a prior marriage that so often results when children are born of the new union and which tend to crowd the others more or less into the background. The runaways from school and the incorrigibility indicate a maladjustment in the home, in the school or in both places. They are contributory factors to juvenile delinquency that must be taken into account if the nation-wide problem ever is to be met and solved. Stealing cars for joy rides which is more prevalent than stealing them for the purpose of stripping or selling directly, undoubtedly is the outgrowth of our competitive mode of living whereby the John Doe's strive to outdo their neighbors thus placing a hardship on the children of less fortunate families. The boys of these less fortunate people in many cases compensate for the lack of a family car by "borrowing" some other person's automobile to take their girls for a ride: A direct violation of law and order to adults but, to the boys, it is merely the indulgence of a natural desire.

The next group of figures is more or less of a miscellaneous collection, but the findings are significant because they indicate a lack in the public school system which is not being adequately met at this time and which contributes to delinquency. Of course, this may not be the only reason for delinquency on the part of public school boys but the inauguration of suitable programs in the public schools of our nation undoubtedly would do much toward substituting for some of the antisocial acts that bring boys to our gates. The data is shown in Table III.

TABLE III. Special Abilities, Hobbies, and Club Membership of the 121 Delinquents

Special Abilities	*Number of Boys Having*
Music	15
Art	10
Cooking	1
Having no special abilities	95
	121

Hobbies	*Number of Boys Having*
Mechanical*	23
Collecting (stamps, etc.)	13
Art	9
Music	5
Reading	2
Science	1
	53
Mentioning more than one	13
	40
Having no hobbies	81
	121

Club Membership	*Number of Boys Belonging*
Boy Scouts	14
Y.M.C.A.	9
Boys' Club	6
Athletic Club	1
Kiwanis Jr.	1
Popeye	1
	32
No club membership	89
	121

*The boys mentioning mechanical pursuits in most cases were merely expressing a preference for these activities as they had not indulged in them to the extent that they actually could be classed as a hobby.

For obvious reasons a tabulation on church membership is not given although one was made up and showed about the same proportion of boys belonging, or who had belonged, as the tabulation for hobbies.

The figures in Table III are significant because they show that the proportion of boys who have developed special abilities such as art, music, dramatics, etc., and have indulged in hobby pastimes or have been members of clubs, is relatively small in comparison to the total. Just what does this indicate? Practically all agree that such agencies have character-building value and other worth-while objectives. Then why are not more boys interested in obtaining membership in such organizations? It is true that the public schools have hobby clubs, they encourage boys to take part in art, music, and to join clubs but the point is that these delinquent chaps, in the majority of cases, are not members of such organizations nor do they participate in such activities. They miss

(Continued on page 16A)

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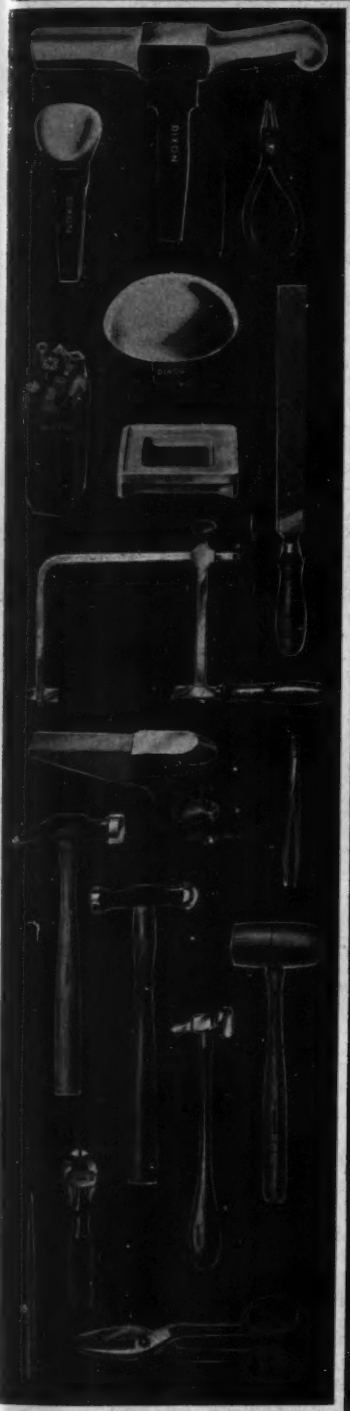

The selection of suitable tools and materials not only results in economy of expenditure but has much to do with the success of projects attempted by students.

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Woodworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Bench
- *a)* Shop, with hardwood tops, 1¾ in. or over in thickness, built up of strips with tongue-and-groove joints, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
  It is a good idea to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type.
- *b)* Glue
- *c)* Stain, with metal-covered top
- *d)* Teacher's demonstration

Blackboard — permanent or portable

Bookcase

Bulletin Board

Cabinets — wood or metal for filing class records, instruction sheets, drawings, etc.

Chairs — teacher's and tablet-arm

Core Oven — for patternmaking class

Desk — teacher's, with drawer compartments

Furnace — for melting soft metals (for patternmaking class)

Glue Pot — 1-qt. or 2-qt. electric, gas, or steam heat

Glue Warmer or Cooker — 1- to 5-gal. capacity

Grinder
- *a)* Automatic knife, direct-motor-drive type. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
- *b)* Bench, hand or power
- *c)* Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
- *d)* Revolving oilstone, pedestal type, with one fine and one coarse oilstone

Jointer
- *a)* 6-in. or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard
- *b)* 12-in., 16-in., or 18-in. direct-motor-drive, ball-bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard

Lantern — Stereopticon-view machine for opaque objects and standard-type lantern slides

Lathes
- *a)* 6-in. to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24 in., 36 in., 48 in., 60 in., or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block
- *b)* Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable-speed motor, faceplates and floor stand. (For patternmaking class)

Mortiser
- *a)* Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod
- *b)* Portable, vertical, hollow-chisel mortiser, bench type

Planer — 12-in., 18-in., 20-in., 24-in., or 30-in. motor or belt-driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible

Sander
- *a)* Belt, direct-motor-drive
- *b)* Disk, motor or belt-driven
- *c)* Oscillating-spindle, motor-driven
- *d)* Portable, hand-plane type, direct motor drive
- *e)* Vertical-spindle and disk sander

Saws
- *a)* Band saw, 20-in. to 36-in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
- *b)* Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded
- *c)* Cut-off, pedestal or swing type to be fitted with 12-in. to 16-in. saw
- *d)* Filing machine, direct motor drive
- *e)* Jig, direct-motor or belt driven
- *f)* Portable band saw, 16 in. to 20 in. ball-bearing, motor-driven
- *g)* Saw bench, direct connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
- *h)* Universal saw bench, 14 in. to 16 in., motor driven
- *j)* Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly, The saw is to be equipped with ripping fence and miter cut-off gauges

Shaper
- *a)* Motor drive, single or double spindle. Table to be equipped with removable center plate
- *b)* Portable shaper or router with a suitable selection of cutters

Tenoner — single end, with coping heads and cut-off saw

Vises — rapid-acting or solid-nut type woodworking-bench vises, 7-in. to 10-in. face

Wood Trimmers — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class)

Woodworking—Small Tools

Awls — brad, assorted sizes

Bevels
- *a)* Protractor
- *b)* Sliding T, 8 in.

Bits
- *a)* Auger, 3/16 in. to 1 in. inclusive, by 16ths
- *b)* Auger, 3/16 in. to ½ in. inclusive, by 16ths
- *c)* Braces, ratchet-type, 8 in., 10 in., 12 in., or 14 in. sweep
- *d)* Countersink, for wood, rose pattern, ½ in. and ⅝ in.
- *e)* Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
- *f)* Expansive, ⅞ in. to 1½ in.
- *g)* Expansive, ⅞ in. to 3 in.
- *h)* Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
- *j)* Screw driver, square shank, ¼ in., 5/16 in., ⅜ in.
- *k)* Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths
- *l)* Twist drill, straight shank, 1/16 in. to ⅜ in., inclusive, by 32nds

Blowtorch

Brooms

Brushes
- *a)* Bench duster, 10 in.
- *b)* Floor
- *c)* Glue, round, 1½ in. and ¾ in.
- *d)* Glue, round, 1½ in.
- *e)* Marking, camel's-hair, No. 1 and No. 2
- *f)* Varnish, flowing, 2 in. and 2½ in.
- *g)* Varnish, flat, ½ in., ¾ in., and 1 in.

Burnishers — oval or round

Can Opener

Carving Tools
- *a)* Sets containing 6 tools
- *b)* Sets containing 12 tools

Chisels
- *a)* Cold, machinists', ⅜ in. and ½ in.
- *b)* Mortising chisel and bits, ¼ in. to ⅝ in. by 16ths
- *c)* Socket-firmer, bevel edge, ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 1½ in.
- *d)* Socket-firmer, plain edge, ½ in., ¾ in., and 1 in.
- *e)* Tanged-firmer, bevel edge, ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 1¼ in.

Clamps
- *a)* Bar, 24 in., 36 in., 48 in., and 60 in.
- *b)* Hand-screw, 4 in., 5 in., 6 in., 7 in., 8 in., 10 in., 12 in., and 14 in.
- *c)* Malleable-iron C, 4 in., 6 in., and 8 in.

Dividers — wing, 6 in. and 10 in.

Dowel Plate — 6 in. long

Doweling Jigs — with bushings

Drawknives — 7 in.

Drill
- *a)* Automatic hand, with 8 drill points
- *b)* Chuck, 0 to ⅜ in.
- *c)* Hand, 0 to ⅜ in., for round-shank drills
- *d)* Star, for concrete, ½ in. and ¾ in.

Files
- *a)* Auger bit, assorted, 6 in.
- *b)* Cabinet, 8 in. and 10 in.
- *c)* Card and brush
- *d)* Flat, wood, 10 in.
- *e)* Mill, bastard cut, 10 in.
- *f)* Round, bastard cut, 12 in.
- *g)* Taper, slim, 5½ in. and 7 in.

First-Aid Cabinet and Supplies

Gauges
- *a)* Bit, adjustable
- *b)* Jointer
- *c)* Marking, metal or hardwood
- *d)* Mortise, metal or hardwood
- *e)* Panel

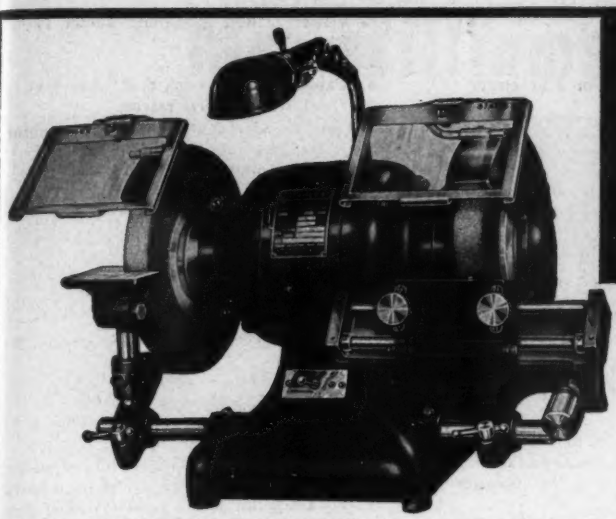
Glass Cutter

(Continued on page 14A)

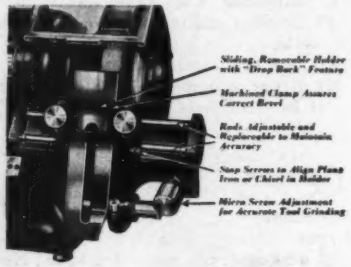
STANLEY ELECTRIC TOOLS

FOR SCHOOL SHOPS

EDUCATIONAL DEPARTMENT
STANLEY ELECTRIC TOOL DIVISION
THE STANLEY WORKS, NEW BRITAIN, CONN.



No. 667 EDGE TOOL GRINDER — An ideal slow-speed, ball bearing grinder for school use. Two 7″x1″ wheels—one for general purpose work, the other specially designed for edge tool grinding. Includes Safety Eye Shields, Adjustable Light Fixture, and the Plane Iron and Chisel Grinding Fixture below.


Sliding, Removable Holder with "Drop Back" Feature
Machined Clamp Assures Correct Bevel
Rods Adjustable and Replaceable to Maintain Accuracy
Stop Screws to Align Plane Iron or Chisel in Holder
Micro Screw Adjustment for Accurate Tool Grinding

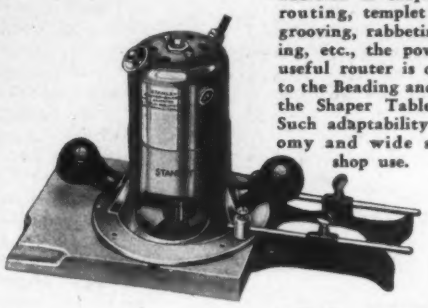
PLANE IRON AND CHISEL GRINDING FIXTURE — To keep edge tools in perfect condition with ease and accuracy. Furnished with No. 667 Grinder above.

STANLEY "VICTOR" DRILL No. 124

DRILL STAND — For the No. 124 Drill listed above. There is a Stanley Drill Stand for every Stanley Electric Drill.

A practical electric drill for the school shop. Its three-jawed geared chuck accommodates standard round-shank twist drills and bits, hole saws, countersinks, plug cutters, etc., up to ½″ shanks. The addition of the Drill Stand shown here makes a fine combination at low cost.

HAND ROUTER No. 10 WITH ALUMINUM BASE



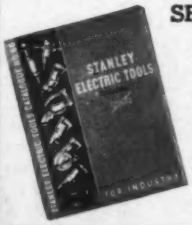
Its 18,000 R.P.M. produces a smoothness of work that makes sanding generally unnecessary. In addition to shaping, inlay work, routing, templet work, veining, grooving, rabbeting, corner beading, etc., the power unit of this useful router is quickly attached to the Beading and Fluting unit or the Shaper Table, shown below. Such adaptability combines economy and wide scope in school shop use.

BEADING AND FLUTING ATTACHMENT No. 64

Employs the power unit of the Hand Router above. Easily used with a lathe or your own holding device where a lathe is not available. Includes a guide collar adjustable to depth of cut, to insure following the contour of the work.

SHAPER TABLE No. 41—With this shaper table and the power unit of the Hand Router, you can produce an infinite variety of cuts without purchasing a special cutter for each. A patented tilting motor holder is adjustable from a vertical position to any angle up to 45°. With four cutters, many different moulding cuts can be made simply by rearranging the cutters on the Spindle, and by changing the angle of the motor unit.

SEND FOR NEW CATALOGS!



No. 66 STANLEY ELECTRIC TOOL CATALOG describes and illustrates the complete line of Stanley Electric Drills, Saws, Unishears, Grinders, and other tools.

No. 605 ROUTER-SHAPER CATALOG illustrates this tool and all of its attachments.

(Continued from page 12A)

Gouges
- *a)* Tanged-firmer, outside ground, handled, ⅛ in., ¼ in., ½ in., ¾ in., 1 in.
- *b)* Tanged-firmer, inside ground, handled, ⅛ in., ¼ in., ½ in., ¾ in., 1 in.
- *c)* Spoon, ½ in., ¾ in., and 1 in.

Hammers — claw, bell-faced, 10-oz., 12-oz., 13-oz., 16-oz

Hatchet — bench, 4 in. cut

Jars — earthenware, 1-qt. capacity

Knives
- *a)* Jointer, to fit power machine
- *b)* Planer, to fit power machine
- *c)* Sloyd, 3 in. blade

Levels
- *a)* Wood, 24 in.
- *b)* Machinists', 12 in.

Mallets — hickory, 3 in. by 5 in. head

Nail Sets — 1/16 in. and 3/32 in. points

Oilers — bench, 1/3-pt. coppered, best grade

Oilstones
- *a)* 1 in. x 2 in. x 8 in. in iron box
- *b)* Gouge slip, medium, 4½ in. x 2⅛ in. x 5/16 in. x 5/16 in.
- *c)* Gouge slip, fine, 3 in. x 2 in. x ⅜ in. x ⅛ in.

Pincers — 6 in. carpenters'

Pinch Dogs — ¾ in., 1 in., and 1¼ in.

Planes
- *a)* Block, adjustable, 6 in. long, 1⅝ in. cutter
- *b)* Circular
- *c)* Combination, adjustable
- *d)* Core box
- *e)* Duplex, fillister and rabbet
- *f)* Fore, ⅛ in., 2⅜ in. cutter
- *g)* Irons, double
- *h)* Jack, 14 in., 2 in. cutter
- *j)* Jointer, 24 in.
- *k)* Round, wood, 1¾ in.
- *l)* Router
- *m)* Smooth, 9 in., 1¾ in. or 2 in. cutter

Pliers
- *a)* Round-nose, 5 in.
- *b)* Side-cutting, 6 in.

Putty Knives

Rasps — half round, wood, 10 in.

Rules
- *a)* Board
- *b)* 1 ft. or 2 ft. graduated by 8ths and 16ths
- *c)* Shrink, ⅛ in., 3/16 in.

Saws
- *a)* Back, 12 in., 14-point
- *b)* Band, ¼ in., ½ in., ¾ in., to fit power machine
- *c)* Compass, 10 in.
- *d)* Coping, frames
- *e)* Coping, blades
- *f)* Crosscut, 9-tooth, 22 in. long
- *g)* Crosscut, circular for power machine
- *h)* Dado, ⅛ in. to 1 1/16 in. to fit power-saw arbor
- *j)* Hack, frames, 8 in. or adjustable
- *k)* Hack, blades, 8 in.
- *l)* Keyhole, 10 in., 10-point
- *m)* Rip, 7-point, 22 in. long
- *n)* Rip, circular for power machine
- *o)* Set, 10 points per inch and finer
- *p)* Set, 10 points per inch and coarser
- *q)* Turning frame, 14 in.
- *r)* Turning blades, 3/16 in. x 12 in., 10-tooth
- *s)* Miter-box, 24 in. x 4 in. saw, 7 in. capacity at miter

Scrapers
- *a)* Cabinet
- *b)* Glue, triangular
- *c)* Veneer, blade 2¾ in. long, handle 11 in. long

Screw Drivers
- *a)* Cabinetmakers', 4 in., 6 in., and 8 in.
- *b)* Quick-return, spiral ratchet

Shoot Board — and plane

Snips — tinners', forged steel, 2½ in. cut

Spokeshaves — adjustable, raised handle, 10 in. long

Squares
- *a)* Combination, 12 in.
- *b)* Try-, iron handle, 8 in.
- *c)* Framing, 2 ft.

Steel Figures — hand cut, ⅛ in.

Tapeline — 50 ft. steel

Trammel Points — adjustable metal frame, steel points

Turning Tools (for 12 lathes)
- *a)* Calipers, 6 in. inside and outside
- *b)* Calipers, 12 in. inside and outside
- *c)* Parting tools, ⅛ in.
- *d)* Round point, ¼ in., ½ in., ¾ in.
- *e)* Spear point, ¼ in., ½ in., ¾ in.
- *f)* Square point, ¼ in., ½ in., ¾ in.
- *g)* Turning chisels, ¼ in., ½ in., ¾ in.
- *h)* Turning gouges, ¼ in., ½ in., ¾ in.
- *j)* Turning skews, L.H., ¼ in., ½ in., ¾ in.
- *k)* Turning skews, R.H., ¼ in., ½ in.

Vise — 3 in. jaw anvil face

Wrenches
- *a)* Adjustable, 8 in., 10 in., and 12 in.
- *b)* Headless setscrew, ¼ in. to 5/16 in. by 16ths
- *c)* Pipe, 10 in. and 12 in.
- *d)* S-type or open-end type to fit ⅛ in. to 1 in. U.S.S. nuts

Woodworking—Materials and Supplies

Alcohol

Benzine

Brads — ⅜ in., ½ in., and 5/8 in. No. 20; ¾ in. and ⅞ in. No. 10; 1 in. No. 18; 1¼ in., and 1½ in. No. 16; 1¾ in. No. 15; 2 in. and 2½ in. No. 14

Carbon Paper — black

Colors — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Van Dyke brown, and vermilion

Colors — ground, in oil or japan: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Van Dyke brown, and vermilion

Decalcomania Transfers

Dowel Pins and Plates

Dowels: hardwood, 3-ft. lengths, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.

Enamel
- *a)* Selected colors
- *b)* Undercoater

Fillers — paste: natural, golden oak, dark oak, and mahogany

Fillets — leather, ¼ in. and ½ in.

Glue
- *a)* Casein, hide, best grade cabinet
- *b)* Liquid

Hardware: Brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

Hooks
- *a)* And eyes
- *b)* Cup
- *c)* Screw and
- *d)* Square screw

Lacquer — black, clear, cobalt blue, ivory, medium green, red, thinner, white and yellow

Lumber — Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine

In ordering pine, mill-run kiln-dried will be found suitable for carpentry, while short, select, kiln-dried 4 in. and wider or No. 1 shop common, kiln-dried will be required for cabinetmaking and patternmaking

Hardwood, for furniture, should be specified first and second grade, kiln-dried, standard widths and lengths, or short lengths

Moldings

Nails
- *a)* Common, 6d, 8d, and 10d
- *b)* Flat-head, ½ in. No. 20, ¾ in. No. 19, 1 in. No. 18, 1¼ in. and 1½ in. No. 16, and 2 in. No. 14
- *c)* Finishing, 4d, 6d, and 8d

Oil
- *a)* Linseed, boiled
- *b)* Linseed, raw
- *c)* Machine
- *d)* Rubbing

Overlay Carvings

Panel or Plywood — 3-ply, 5-ply, and 7-ply

Pattern Letters

Pins — escutcheon

Pumice Stone — No. 0

Rapping Plates

Rottenstone

Sandpaper — Garnet cabinet paper, 3/0, 2/0, 0, ½, 1 (running from fine to coarse)

Garnet finishing paper, 6/0, 4/0

Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

Screw Eyes

Screws
- *a)* Flat-head, brass, No. 3 x ⅜ in., No. 4 x ½ in., No. 5 x ⅝ in., No. 5 x ¾ in., No. 6 x ¾ in., No. 8 x 1 in., No. 10 x 1¼ in., No. 10 x 1½ in., No. 12 x 1¼ in., No. 12 x 1¾ in., No. 10 x 2 in.
- *b)* Flat-head, bright, No. 3 x ½ in., No. 4 x ½ in., No. 6 x ¾ in., No. 8 x 1 in., No. 10 x 1 in., No. 10 x 1¼ in., No. 8 x 1¼ in., No. 14 x 1¼ in., No. 10 x 1½ in., No. 12 x 1½ in., No. 10 x 1¾ in., No. 12 x 1¾ in., No. 10 x 2 in., No. 12 x 2 in., No. 14 x 2 in., No. 12 x 2¼ in., No. 14 x 2¼ in., No. 14 x 2½ in.
- *c)* Oval-head, brass, No. 5 x ¾ in., and No. 10 x 1¼ in.
- *d)* Round-head, blued, No. 3 x ⅜ in., No. 3 x ½ in., No. 5 x ¾ in., No. 6 x ¾ in., No. 8 x 1 in., No. 10 x 1¼ in., No. 10 x 1½ in., No. 12 x 1½ in.
- *e)* Round-head, brass, No. 2 x ⅜ in., No. 3 x ⅜ in., No. 4 x ½ in., No. 3 x ⅝ in., No. 5 x ¾ in.

Shellac
- *a)* Orange, cut 4 lb. to the gal.
- *b)* Sticks, assorted colors
- *c)* White, cut 4 lb. to the gal.

Note: Shellac should be kept in glass or earthenware containers

Stains — oil, spirit or water: Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut

Steel Wool — No. 0 and No. 00

Turpentine

Twine

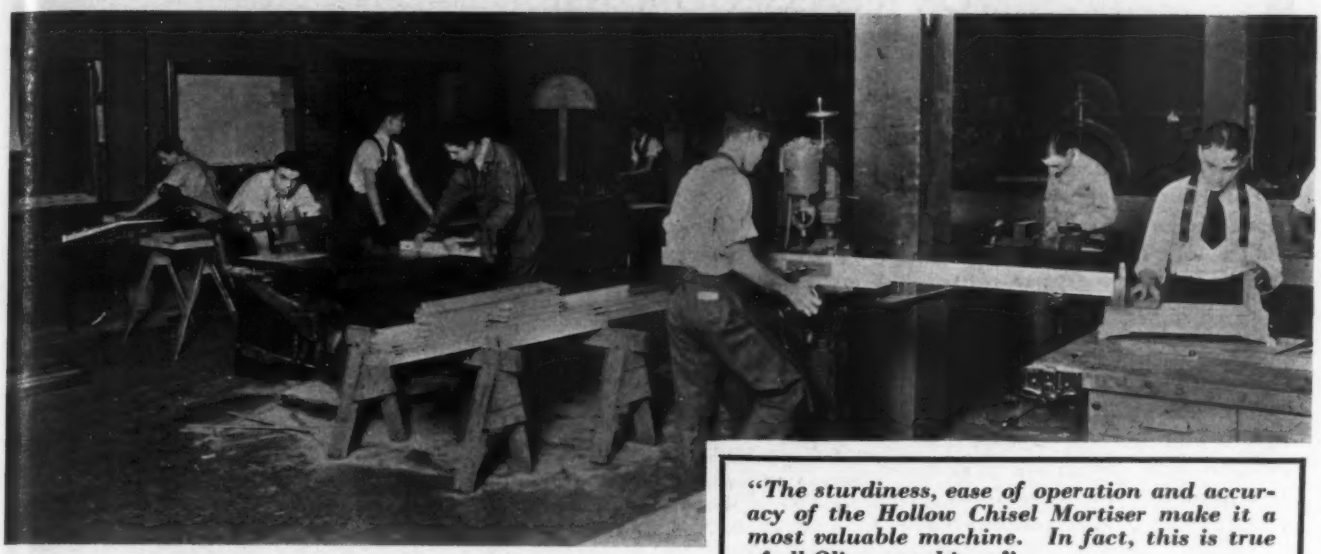
Varnish — coach, flat, remover, spar, and rubbing

Waste — cotton, white

Wax — bees and finishing

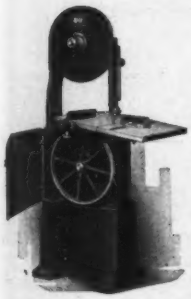
White Lead

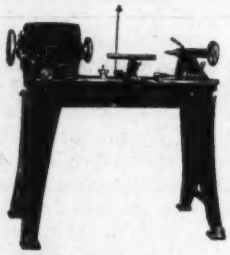
Mr. Williams, you're right

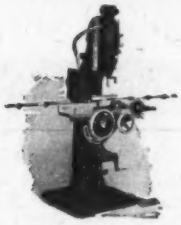


"The sturdiness, ease of operation and accuracy of the Hollow Chisel Mortiser make it a most valuable machine. In fact, this is true of all Oliver machines."

R. E. WILLIAMS
Director of Industrial Education of Public Schools, Parsons, Kansas







In his shops today Mr. Williams has 35 "Oliver" machines purchased at various times since 1907 when he bought 14 Speed Lathes. After 32 years of service these lathes are still giving excellent accounts of themselves. And when you consider the treatment a lathe must endure at the hands of a young woodworker, this is a splendid record, Mr. Williams thinks.

This amazing ability to "take it" year after year without flinching characterizes all "Oliver" machines. For they are designed and built for industry by men who also know the needs of students for thorough, practical training plus safety.

You'll find hundreds of instructors and supervisors agree with Mr. Williams that "Oliver" machines do *give more for the money* in performance. Their features reflect the finest engineering and expert craftsmanship.

"OLIVER" INTERCHANGEABILITY

makes Mr. Williams' 27-year old lathe as new as today

Away back in 1912 Mr. Williams bought 6 more "Oliver" Speed Lathes. In October 1939 he bought the latest type "Oliver" Adjustable V-Belt Motor Driven Headstock unit, and found it fitted his 27-year old lathe perfectly. Modernized, that lathe is turning wood as smoothly, quickly and accurately as a new lathe.

"OLIVER" WOODWORKING MACHINES

Circular Saw Benches	Band Saws	Jig Saws
Cut-Off Saws	Band Saw Brazers	Sanders
Wood Lathes	Jointers	Shapers
Surface Planers	Mortisers	Glue Heaters
Oilstone Tool Grinders	Boring Machines	Vises
Wood Trimmers		

Write for Specifications, Literature, and Prices

"OLIVER" MACHINERY COMPANY, Grand Rapids, Mich.

"OLIVER" WOODWORKING MACHINES

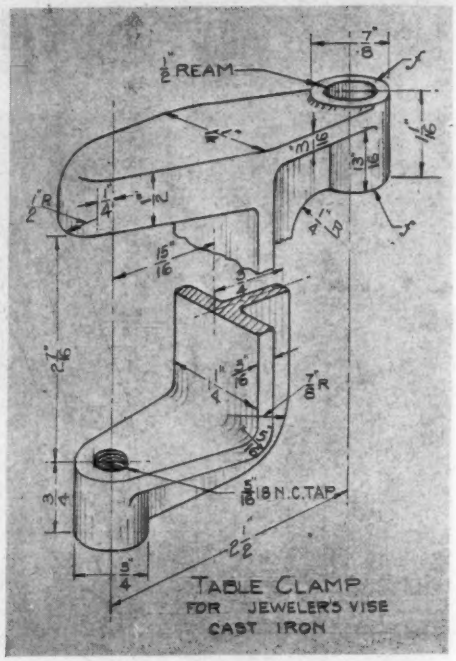
PROBLEM NO. 3
FOR CLASSROOM USE

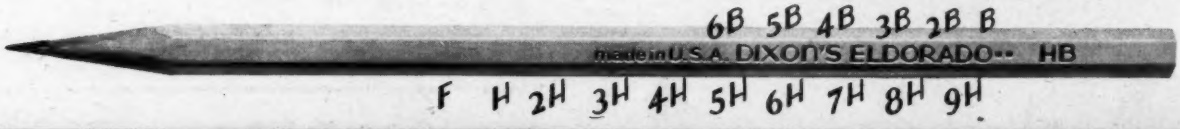
Drawing the orthographic views of this table clamp is the third in the series of mechanical drawing problems suggested for classroom assignment by Dixon, the maker of Typhonite Eldorado Pencils. And, for your convenience, you may get a free blueprint showing the solution to the problem.

For mechanical drawing you'll find Typhonite Eldorado an ideal pencil. And one of the reasons is Typhonite, the new form of natural graphite. Typhonite consists of extremely minute particles made by battering natural graphite in a whirlwind or typhoon of dry steam. Try perfectly graded Typhonite Eldorado pencils. Note their clean, opaque lines that are ideal for blueprinting.

PROBLEM: Ask your students to draw the correct orthographic views of this table clamp for jeweler's vise.

SOLUTION: For a blueprint showing the problem's solution just write to School Bureau, Joseph Dixon Crucible Company, Jersey City, N. J., for blueprint No. 128-J3.





SCHOOL BUREAU, JOSEPH *Dixon* CRUCIBLE COMPANY, JERSEY CITY, N. J.

(Continued from page 10A)

out on a stabilizing effect, the character-building effect that is supposed to be the result of membership and participation in the activities of such organizations. Their time outside of school hours is not occupied profitably and they naturally drift into paths of temptation and, subsequently, into delinquency, for it is the after-school hours and in the evening before bedtime when juvenile delinquency generally flourishes.

Stanford tests and the grade levels in each

Boys	Average	Paragraph Meaning	Word Meaning	Dictation	Language Usage	Literature	History & Civics	Geography	Physiology & Hygiene	Arithmetic Reasoning	Arithmetic Computation
1.	6.2	7.0	7.6	6.1	6.8	3.1	5.9	5.7	7.8	10.0	5.6
2.	5.8	6.7	5.6	6.1	3.4	6.1	6.6	6.4	7.2	6.8	4.7
3.	4.1	4.9	5.5	4.1	2.6	4.7	2.6	4.8	4.1	4.6	3.9
4.	7.8	8.9	9.2	9.2	8.9	6.8	7.3	7.4	7.6	7.4	6.0
5.	5.2	5.7	6.3	5.1	4.7	5.0	3.1	5.7	4.3	6.8	6.8
6.	5.0	5.8	5.5	3.4	4.1	3.6	4.3	5.7	6.6	8.7	4.7
7.	6.1	4.9	7.9	6.0	4.4	8.4	6.4	6.1	6.6	6.8	4.9
8.	6.1	6.1	6.3	5.0	6.4	7.9	6.4	5.6	6.7	7.6	4.2
9.	6.8	6.8	7.8	7.4	5.8	5.0	7.2	7.6	7.5	7.1	8.1
10.	6.0	7.8	7.2	4.5	5.7	7.6	6.6	5.7	5.4	6.1	5.2
11.	4.2	4.6	5.6	5.5	3.9	3.6	4.0	4.6	2.8	5.7	3.4
12.	5.1	4.9	5.7	6.2	5.0	5.0	4.6	4.7	4.1	6.1	5.2
13.	6.8	6.4	7.4	6.2	6.8	6.6	6.6	6.1	6.8	8.2	7.5
14.	5.3	5.9	6.3	3.8	2.6	7.4	4.6	6.3	7.0	6.8	5.2
15.	7.2	7.0	6.7	6.1	7.6	5.0	7.2	7.0	8.2	10.0	8.1
16.	5.9	5.7	4.9	6.7	4.8	5.6	4.1	5.5	7.0	7.6	9.7

Table IV. Scores on the Stanford achievement test made by sixteen 7th grade boys at Colorado State Industrial School

Since so many of the boys received here are retarded in their schoolwork or have been passed along above their abilities, it has been found necessary to give each boy a diagnostic test in the fundamental subjects of arithmetic, reading, and spelling and assign him to academic classes by subject rather than by the conventional grades. In Table IV are shown the scores on the Stanford Achievement Test which was given to a group of 7th-grade boys for the purpose of classification and which illustrates some of the reasons for maladjustment in the public schools and the reason why pupils should be placed by subject and taught by subject rather than by grades.

It makes no difference which way the figures are read, across by individual or up and down by subject, one sees at a glance the wide range in ability for the group as a whole. And the range for the group is about as great as it is for the individual by subject wherein probably lies the seat of his maladjustment to the public school program. To take some specific instances, how can No. 1 be expected to keep up with his classmates in literature although he has a fairly good score in the other tests. And how can No. 3 in history or No. 6 in spelling be very happy about their work when they are clearly outclassed by the others of the group in these subjects? These are only a few instances but they illustrate the fact that there are maladiustments in the schools due to lack of ability, and this variation in ability may be not as great between individuals as it is for the individual himself by subject. If a maladjustment is allowed to continue, it soon results in truancy and truancy so often leads to juvenile delinquency.

How, then, can the public schools do anything about juvenile delinquency? Insofar as it is financially impossible for the schools to aid in remedying poor home conditions, that aspect of the situation becomes a community rather than public school problem. The maladjustment of students to the regular academic program, however, can be helped considerably by employing the same methods which have been used successfully at this institution; namely, placing the students by subjects rather than by grades and the substitution of vocational for academic work for those who do not profit by the conventional studies. It is true that in some systems maladjustment has been alleviated, if not removed, by some such treatment, but in general, unfortunately, the schools have tried to fit the individual to the program rather than fitting the program to the needs of each student.

There are some who might say, "Why bother with these misfit students who generally become delinquents anyway? Why not concentrate on the others who will become the successes and leaders of tomorrow?" But this is not strictly true for many of the leading business, professional, and political men of this state were

(Continued on page 19A)

C51 CARTER Bench Shaper

Table only, $29.50
1 H. P. Motor unit
$81.00

For Those *"Professional"* FINISHING TOUCHES

Now your students can give their work the professional finishing touches so difficult to make by hand. The new Heavy Duty Carter Bench Shaper No. C51, with the exclusive Tilting Spindle, allows more cuts with fewer cutters because the patented motor holder can be tilted from vertical to any angle up to 45°. Cutter costs are reduced — time spent in grinding, matching, balancing blades, eliminated. Cuts are smooth, need no finishing. Combination Router-Shaper 1 H.P. motor turns at 18,000 R.P.M. Machined steel table top measures 16″ x 26″ making it large enough for practically all shaping work. Catalog 75 gives full details. Send for a copy.

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Complete with straight and circular gauge.

Unit $30.25

This light, compact, direct-drive router with the proper accessories and various Carter bits will handle many types of decorative cuts — veining, line and inlay routing, light core box work, corner beading and rounding.

1/7 H.P. 18,000 R.P.M. Motor. Motor casing is threaded to fit similar threads in Router Base, thus affording easy, accurate depth adjustment.

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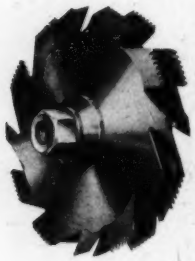
Dado Head



Our dado head developed from our own patents cuts grooves with or across grain, smooth, sharp sides, grooves from ⅛" up to 4" and over. Easily adjustable. Consists of 2 outside Cutters ⅛" thick and inside cutters to make desired cut. Inside cutters in 1/16", ⅛" and ¼" thicknesses. These Groovers make a perfect cut and leave the bottom smooth.

Angular Hub Groover

(New Patent No. 1782507)

This Groover was designed to cut end grooves in hard wood and to clear itself easily without swage or set. Clearance is effected by angular grinding of hub. Light adjustment. Used on regular saw mandrel without extra collars.

High Speed Knives

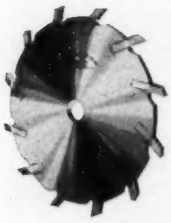
Shaper Stock, Ground Flat Stock

We manufacture thin High Speed Steel Knives, Solid Moulder Knives from High Speed Steel or Special Laid Steel. We can also furnish ground stock in various thicknesses and widths, square edges, in High Speed or best quality Tool Steel.

Band Saws

We make both wood and metal cutting band saws, also special temper saws for fibre, bakelite and soft metals. Let us know what you cut and we can furnish a saw for the purpose.

Inserted Tooth Groover



This is the perfect Groover for end grain cuts in hard wood. Teeth are High Speed Steel, front to back clearance, and require grinding on top only. Cuts full width groove through life of teeth. Teeth can be replaced.

New Steady Rim Rip

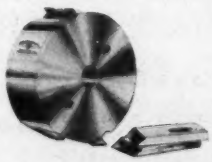
This is an extra smooth cutting Rip Saw designed for smooth cutting at fast feed. This is the smoothest cutting Rip Saw we have and is capable of beautiful work.

Saw Vise

Setting Stake

These are useful articles for the filing room and were both developed for use in our own filing department. Vise is easily adjusted for various bevel filing and takes saws up to 18" diameter.

Cutter Heads for Saw Mandrel



Cutter Heads for use on saw table. These heads can be furnished with variety of knives and used for jointing and running light moulding on saw table. Made in 6" diameter, 2¼" wide. Can be counterbored if necessary.

Mitre Saws

Our Mitre Saws are accurately ground with the proper side clearance and are made in six styles of tooth shape. Cleaner Tooth Saws are for both rip and cross-cut—made in diameters from 4" to 24".

The Lightest Power Tools Are For Home Shops

but—
Modern Schools and Industry Use
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Pay less in the end for Boice-Crane, but get also *fool-proof controls, "dead-shot" accuracy, flawless operation and less work spoilage.* You'll automatically step up your shop work practice to the same high level as your teaching of theory in the classroom.

Complete Safety is "Designed - In"
Safety is "designed-in," and *built right into* Boice-Crane machines. And unlike many machines you've seen, Boice-Crane guards *don't* interfere with practical, normal operation of the machine itself. Our super-safe Helmet Head Drill Press shown opposite is a notable example. Everything guarded, but access is still easy and quick, and, the guard is *never* removed from the machine. Always ready for use.

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BOICE-CRANE POWER TOOLS

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(Continued from page 16A)

at one time inmates of this very industrial school, and many of them were the maladjusted pupils of the public schools of yesterday. Other industrial schools throughout the nation undoubtedly can truthfully say the same thing about the leading men of their respective states. The writer believes, therefore, that the maladjusted student is worth the expenditure of considerable time and effort by the public schools and that he should be helped in his problem of meeting the life situation immediately confronting him. This can be done in the following ways: He should be aided in his classwork by being assigned to his own respective level of ability by subject. If he is not capable of absorbing abstract studies, he should be provided with the vocational, or prevocational, work for which he is fitted depending on his age, and this vocational work should have as its objective the eventual indenturing of the boy into a regular apprentice-training program. Reference is here made, of course, to the boy who is too young and immature for regular trade training. The older boys now, in progressive systems, are shifted into vocational training in keeping with their abilities especially those who do not make progress in the regular academic studies.

Special abilities, hobbies. and clubs — where do they fit into the picture? From a strictly vocational standpoint, the writer would require participation in one or the other as a requisite to the completion of a trade course of training. From the standpoint of the maladjusted student who is not yet, because of age, a vocational student, such activities should operate during the after-school and in the evening hours, rather than during the regular school day as is the general custom. The hours during the school day should be given over to intensive help in those subjects in which the individual is weak, leaving the extraschool hours for hobbies, music, art, and other activities that can be worked into a definite program and for which regular school credits should be given the same as for regular school studies.

Such a program would require someone's time and the expenditure of some money but, in the final analysis, is it not worth while? It costs, at the present time in this particular institution, $617.73 per year to feed, clothe, and educate each boy committed. If one third this amount were spent on the boy before he got into trouble, by way of properly adjusting the school program to his needs, furnishing him a way to spend his after-school and evening hours profitably instead of hatching up skullduggery, he very likely never would find himself in this institution, and he would not be invested with the stigma that somehow attaches to every person that is sent to a penal institution. And the state would still be money ahead because it would not have to furnish board, room, and clothing during a period of the boy's life.

The shop teacher in the public schools is in an admirable position to save a lot of boys who are on the verge of becoming juvenile delinquents because of the fact that he is teaching the activities in which such boys are more likely to be interested. A program of salvation for these boys, if such it may be called, would require a club, or other center, where they could play, swim, work on handcraft, receive musical training, and where regular meetings managed by boy officers could be held. Such equipment is now available in practically every community where juvenile delinquency exists, and would not require hardly any additional money. It would be necessary only to institute a program with suitable persons in charge. As the delinquent boy is more or less touchy on the subject of personal affairs, the person in charge of the club would have to be capable of meeting them on their own ground in every way. In other words, he should be a real "he" man and not border on the effeminate. He should have an immense amount of sympathy, patience, and faith in the boys even though some of them occasionally might "let him down." He should, above all other things, be firm and let them know at the outset that he is the

(Continued on page 20A)

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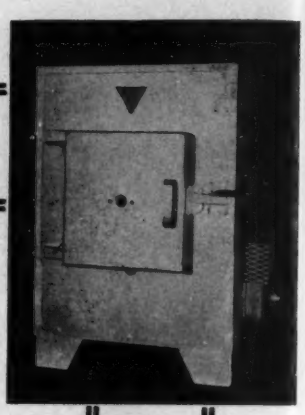
Dependable pottery equipment and supplies from one source of supply is assured when ordering your needs from Pereny Pottery and Equipment Company. Our very complete line enables us to serve your every want. A few pieces of equipment are illustrated.



BALL MILL

Overall dimensions: 16" x 18" floor space. Max. Ht. 36". Cast iron construction, rubber rollers. Bearings at points of greatest wear. Quarter horse power motor. Eighteen month guarantee. The Pereny Ball Mills are available in sizes ranging from one jar capacity up to 12 jars. Patent Pending.

We are able to furnish anything in Ceramic equipment or supplies. We suggest that you write for quotations on all your requirements.

Write for our Bulletins No. B-38 and B-39.

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Pereny "Globar" Elements

"L" Series recommended for temperatures up to 2000°F.

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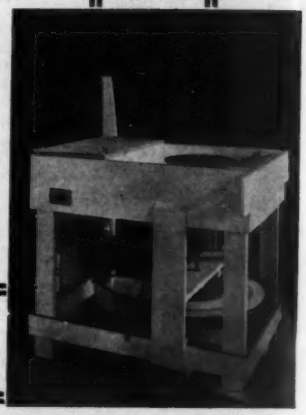
Practically BURNOUT-PROOF "GLOBAR" elements, good for 1500 to 2000 firings. Made of the finest grade insulating material obtainable and covered with heavy Steel Shell. Kiln sizes available range from 9" x 9" x 9" usable space up to any size desired. Inquire about our ELECTRIC FORGES and MELTING FURNACES.

POWER WHEEL

Overall measurements, 36" high by 38" wide by 26" deep. Belt driven, friction clutch, variable speed, foot control. One quarter H.P. motor. Eighteen month guarantee. Patented.



PERENY POTTERY and EQUIPMENT CO.
842 North Pearl Street -:- Columbus, Ohio

(Continued from page 19A)

boss but that he is there to help them in solving their problems and is anxious for them to succeed.

As to participation in these after-school activities, it should be voluntary for the most part. This is necessary because there are those boys who are already on probation to the juvenile courts or attendance officers of the school system. Such boys should be placed on a preferred list and special effort should be made by a properly qualified person to interest them in the activities available in the center. It would do no good to try to compel them to attend because the courts try to make them report at intervals while on probation and fail miserably in the attempt as shown by their own case histories. Such boys' interests, whatever they may be, must be aroused and guided into the proper channels of productive effort. The very fact that delinquent boys do not conform to the conventions of our public school systems, shows that they have initiative even though it is expressed oftentimes in a perverted manner. And in this expression of initiative they reveal a high degree of resourcefulness which, if properly guided, is helpful in the development of satisfactory citizens.

The old saying, "An ounce of prevention is worth a pound of cure" although it may be trite, still contains a lot of truth and applies especially to adolescent, delinquent boys. If, through proper analysis of the individual who is about to become delinquent, a suitable program can be arranged that will keep him from becoming a ward of the state, is it not worth someone's time and someone's money? It will be worth trying even if but a few boys with tendencies toward delinquency can be taken in hand and reclaimed without the necessity of spending some of the best years of their lives in an institution. The writer believes, however, that this can be done in a majority of the cases and that it can be done through the mediums of subject placement rather than grade placement, through proper vocational and prevocational training for boys not suited to the conventional academic subjects, and through the inauguration of a program of training in special abilities such as art, music, dramatics, and a constructive program in hobbies which would operate during the after-school and evening hours rather than during the regular school day. The program may be further sugar coated by giving regular school credits for participation in these activities. The main thing, however, is to keep the boys occupied during the dangerous hours — and thus keep them out of trouble and delinquency.

The Teaching of Electricity

Wynne L. McDougal

Head Department of Electricity,
Pullman Free School of Manual Training,
Chicago, Illinois

Believing in the subject and determining how it is to be taught is one of the marks of a good shop teacher.

The teacher of electricity faces a peculiar situation. There is, perhaps, no other subject in the curriculum as intangible as his. Yet he can make it readily teachable in its many phases by selecting a proper vehicle for its presentation. This vehicle may be mathematics, or it may be mechanics.

Of these, mathematics offers the easier way. Its use calls for little equipment, the students are kept busy, knowledge is certainly acquired; but, as the course advances, that broad and indefinite line which holds between shop and engineering courses is being crossed to a greater or less extent.

(Continued on page 26A)

NEW WALL CHART TELLS STORY

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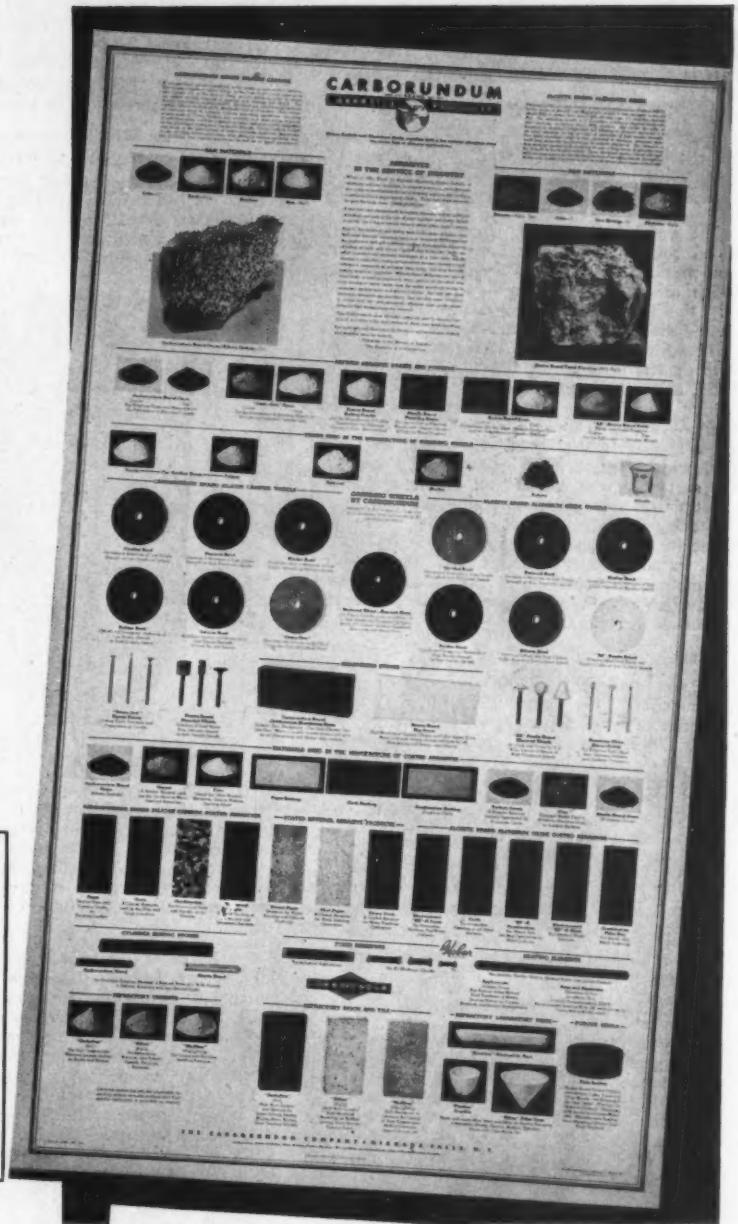
Every vocational teacher needs one of these natural-color educational charts for classroom use

JUST out, this 23″ by 41″ chart, printed in natural colors, describes the manufacture of Carborundum Brand Silicon Carbide and Aloxite Brand Aluminum Oxide Abrasives and the Super Refractories produced by The Carborundum Company. The chart contains a wealth of material for interesting class lectures and work projects and will go far toward helping you give your students a thorough understanding of one of our basic industries . . . manufacturing indispensable tools for *all* industry.

This valuable wall chart is free to vocational teachers. Simply fill out the coupon below, giving your name and address, your school and the courses you teach or your title.



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SHOP EQUIPMENT NEWS
NEW PRODUCTS — PUBLICATIONS

Stanley Plug-Tip Soldering Irons

A number of new electric soldering irons fitted with plug tips have been added to the extensive line offered by Stanley Tools, New Britain, Conn. The plug tip is inexpensive and differs from the screw tip in that the tip fits into the heating head of the iron and is held by a screw. The screw permits easy adjustment and removal of tip.

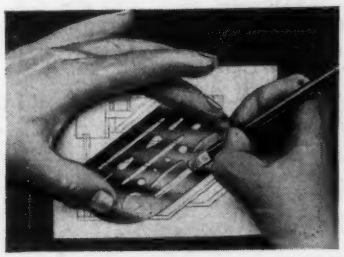
The heating unit of the iron is hermetically sealed to protect the windings from corrosion. The windings are mounted around a hollow core which conducts a uniform flow of heat to the plug tip. The handles are of hardwood and have an adjusting sleeve which allows the handle to be adjusted for length. Each iron is furnished with six feet of approved heater cord, cord strain relief, and a tool-rest stand.

Plug tips for the irons are available in two types — copper and armor clad. The armor-clad tip is similar to the copper tip except that it is clad with a special metal coating that protects the surface of the copper and produces a long-life tip free from corrosion and rapid wear.

Stanley plug-tip electric soldering irons are made in four sizes — 105 watts, 3/8-in tip diam., 150 watts, 1/2-in. tip diam., 200 watts, 5/8-in. tip diam., 350 watts, 7/8-in. tip diam. Each size is available with all-copper tip, or with the armor-clad copper tip.

Non-Skid Erasing Shield

A new *skidproof* typewriter erasing shield is announced by the Eugene Dietzgen Co., manufacturers of drafting and surveying supplies, Chicago, Ill. This Non-Skid erasing shield is pro-



vided with cupped openings for finger and thumb which grip the shield firmly to the paper and prevent the shield from slipping. This simple, practical idea puts an end to the mess and irritation common to the ordinary, slippery type of eraser shield. It is made of the highest grade flexible safety razor steel, 2 3/8 by 4 3/8 in., with 14 openings.

Electric Burn-in Knife

An electric burn-in knife for application of stick shellac has recently been patented by the M. L. Campbell Co., of Kansas City, Mo.

This new tool is meeting with enthusiastic acceptance by finishers as it does away with the old problem of constantly reheating knife or spatula. Stick shellac must be applied with a hot knife at just the right temperature to melt, but not to scorch or burn. The knife must be maintained at the proper temperature all through the process of filling in the imperfection in the surface, and smoothing it evenly. With a gas or alcohol flame, or even with an electric heater where several knives can be kept hot, much time is lost and uniform results are by no means certain.

The new Campbell electric knife maintains a uniform correct heat. The heating element gives just the proper temperature and no more. It enables the workman to do more and better work as it never blisters the finish nor burns the cement. The standard knife is inexpensive and works on any 100–120-volt light circuit. It also may be obtained for 220-volt circuits.

New Melting Furnaces

The Reliable Gas Products Co., Cedar Rapids, Iowa, are marketing a newly developed line of "Put the Heat in the Pot" melting furnaces which are completely fire-brick lined and which need no blowers or forced air. They are low in first cost, and low in operating cost.

There are at present four sizes each equipped with a special-mixture long-life pot. The capacities vary from 150 lb. lead or 38 lb. aluminum to 600 lb. lead or 60 lb. aluminum.

Besides these new melting furnaces, this firm also manufactures Babbitt furnaces; bench furnaces; Bunsens or laboratory burners; annealing, case-hardening, heat treating, and metal melting furnaces; heat-treating equipment, melting-pot equipment; soldering furnaces, and soldering torches.

Black-on-White Linoleum Block

F. Weber Co. of Philadelphia, Pa., has just announced their new Black-on-White linoleum blocks which are the latest innovation in the art of block printing. They are made with a black surface on white linoleum, which is mounted on a 5-ply wood block.

The advantages of the Black-on-White block are many. The artist sees just what he is getting. What he cuts out of the block will both show white and print white, and what he leaves will both show black and print black, and exact duplication except that it is reversed from left to right.

Another important feature is that the original design may be scratched through the black surface, in the same manner as a scratch board is used. The scratched drawing may be completed to look exactly like the desired results before any cutting is attempted. Rhythm and poetry of line is obtained direct and tonal values may be very easily achieved on the block in the process of cutting.

Deep gouging is unnecessary on the Black-on-White block, as the rigid black surface on the white linoleum will retard the usual yielding of a plain linoleum block when under the pressure of printing.

Complete information and prices of the new Black-on-White blocks may be obtained by writing the F. Weber Co., 1220 Buttonwood St., Philadelphia, Pa., or to either of their distributing branches, 705 Pine St., St. Louis, Mo., or 227 Park Ave., Baltimore, Md.

High-Speed Heat Treating Furnace

The Johnson Gas Appliance Co. of Cedar Rapids, Iowa, has just placed on the market a new high temperature heat-treating furnace for Hi-Speed steels. This new No. 70 furnace is primarily designed for high-speed steels, but can be used effectively for carbon and intermediate steels, and is excellent for hardening punches, dies, and tools. It is also ideal for industrial-arts departments of vocational schools.

New Super Caster

Many new and desirable features have been worked into the design of the New Speed-Line Super Caster now available from Nolan Machinery Corporation of Rome, N. Y.

Perfectly balanced platens give this new caster finger-tip control. Despite the extremely heavy weight of the platens they are rolled in and out of position with ease. The platens are guaranteed for ten years against warp.

Automatic clamps hold platens in open position until released by a foot treadle. The new safety pot holds 300 pounds of metal and pours from the bottom through a special lip that completely eliminates escape of dross and prevents the troubles usually experienced from an intricate valve.

The new super-caster is made in three popular sizes, 5 columns by 18 inches, 5 columns by 26 inches, and 6 columns by 26 inches.

Carving

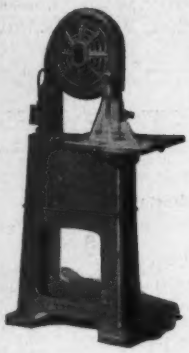
Mr. Julian Kirby, president of the St. Paul Machinery Mfg. Co., St. Paul, Minn., makes this interesting statement about hand carving: The best way to teach hand carving is to use carving tools and go right at the job. This is the method that should be used with adults, but most of the vocational teaching is with the young, who must be stimulated in some way or other if their interest is to be maintained.

At first thought it seems a mistake to suggest the use of a machine to teach hand carving, but by roughing out carvings on a carving machine and leaving enough finishing for the beginner, the results which he obtains come so quickly that they stimulate his interest. The next time more finishing may be left to be done, and after the beginner has demonstrated to himself that he can get worth-while results, he will be ready to work without any help from the machine and will learn to be a real hand carver.

By using this method the instructor need not

(Continued on page 26A)

What's Next on the Program?



Wallace 16" and 14" Bandsaws — speedy, accurate, durable. Motors up to 2 H.P.

NO matter what your woodworking machinery requirements, you'll find the answer in J. D. Wallace & Company's complete line of woodworking machines partially illustrated on this page.

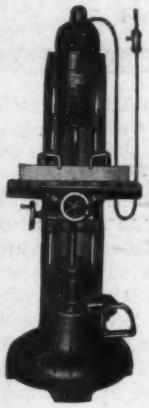
These are not home shop machines, nor are they heavy mill units. They are quality-built cabinet shop tools, used today in 75,000 industrial shops in addition to thousands of schools and colleges teaching *practical* industrial arts.

For fine, accurate furniture and cabinet-making, you can buy no better machines at *any* price. *Safety* is guaranteed with modern, approved guards.

Accuracy is maintained by machining to close tolerances, and by provisions for adjustment on most parts subject to wear. *Durable*, of course, being made of the best materials.

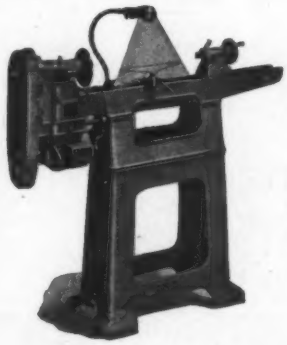
What about *economy?* Well, the true answer can only be determined by Experience, — by an addition of first cost *plus* maintenance cost *less* the value in trade when changes are made. Twenty-five years of Experience shows that Wallace tools are the most *economical*, all things considered, of any equipment manufactured.

We'll be glad to confer with you at any time. Tell us of your requirements, — we'll see that complete bulletins and quotations are forwarded promptly and without obligation.



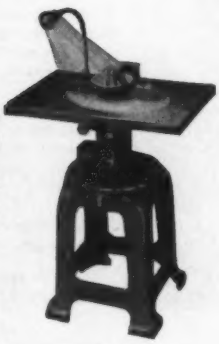
Wallace Mortiser —handles chisels and bits up to 1" square. Direct-drive motors up to 2 H.P.

Wallace Universal Saws — up to 4" depth of cut, 14" cut-off, 24" rip. One and 2 H.P. motors. Tilting arbor.



Wallace Lathes —with automatic tensioning drive. Perfect for wood-turning and metal-spinning.

Wallace 6" or 8" Jointers — with direct or gear-drive motors. Machines of proven economy.



Wallace Shapers — 8,500 or 10,000 r.p.m. Direct-drive motors, safe, powerful, smooth-cutting.

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ATLANTA • 118 Spring St., N. W. • COLUMBUS • PORTLAND • NEW YORK 250 Park Avenue

(Continued from page 24A)

necessarily be a hand carver himself. It is easy to learn how to carve on the machine, and by giving the pupils unfinished work to finish and with the proper tools, all the instructor needs is an eye for shape but not necessarily a skilled set of hands to do the work. Of course, the instructor too, can acquire skill at hand carving by this method in the least possible time.

Addition to Plant

The illustration shown herewith depicts a one-story monitor type, 122 by 404 ft. factory building which the Behr-Manning Corp. (Division of Norton Co.), Troy, N. Y., has recently added to its plant.

This modern building consists of a steel frame, brick, steel sash, concrete floor, and insulated wood frame, and provides the plant with an additional floor space of approximately 50,000 sq. ft.

Correlation on Bookbinding

The Chas. M. Higgins and Co., Inc., 271 Ninth St., Brooklyn, N. Y., has just issued correlation project No. 8 on bookbinding.

The 8-page pamphlet describes how to make the sewing frame, and the sawing and gluing press. It also lists the few tools that are needed and the materials that are required.

Part I then gives concise directions for the reconstruction of an old book and Part II contains the description of binding magazines into a new book.

This project material may be bought for classroom use at a very nominal price.

Storing Sandpaper

The January, 1940, *Barneygram*, a little trade paper issued by Behr-Manning (Division of Norton Co.), Troy, N. Y., for its distributors, makes the following interesting and helpful comment on the proper storage of sandpaper:

1. Do not let sandpaper get too dry. (Keep away from radiators, dry kilns, etc.).
2. Do not let sandpaper become too damp. (Keep away from open windows or damp floors.)
3. Between 35 per cent and 50 per cent relative humidity is a favorable range.
4. Temperatures between 60 and 70 degrees are safest.

The Testing of Electricity

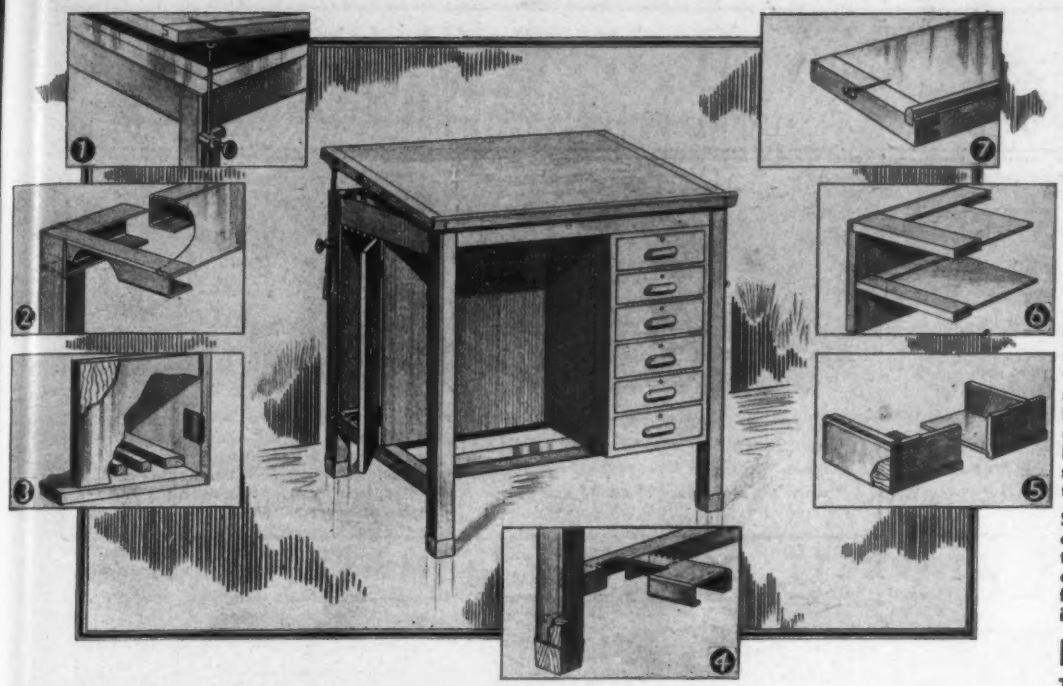
(Continued from page 20A)

Good judgment in the selection of these electrical-math problems can hold them down to the intelligence level of the secondary-school shop student, thus leaving the engineering problems for the college level. But electrical mathematics alone is certainly not a shop course, unless mechanics, too, is brought into the picture. Mathematics must not, however, be pushed aside. Instead, it must be used frequently and diligently, for it is only when things can be measured and calculated that real progress in their use can be made.

The writer, who had had many years of practical experience with electrical devices before he became a teacher, still remembers the blank stares with which his students greeted the first d.c. motor field coil which he showed them after having given them a rather thorough drilling in the theory and mathematics involved in the classroom. The perfect shape and neatly taped form of the actual coil in no way resembled the symbols that had been used to represent a coil on the blackboard. Thereafter, he kept on hand many pertinent exhibits for ready reference in order to help the student establish an understanding more easily by forming an association with actual devices. But exhibits alone will not suffice either. Actual assembly of parts is good, but better yet, is a form of instruction where some parts are actually made by the student. It seems that *homemade* devices carry over better than factory-built ones. In the homemade types there seems to be a sort of acceptance by the student that they would be within his power to construct. They are at least more readily understood than if the device be a much finer thing built in a factory.

There are two main divisions in electrical work; *light* and *power*. Of course, light is in reality an application of the *heat effect*. Likewise, power is the utilization of the

(Continued on page 29A)



The New Lifetime Drawing Table

This new type of drawing table originated by Hamilton is made of both steel and wood. This construction insures strength, rigidity and long life, even under continuous school use. It is truly a lifetime table. Notice the seven features illustrated at the left.

Send in the coupon for a complete catalog of laboratory and vocational furniture describing in detail lifetime features of Hamilton Drawing Tables.

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Benoit Public Library

(Continued from page 26A)

magnetic effect. Many subheads exist under each; particularly is this true of the latter.

Since electricity will only work when properly harnessed, the subject of the *circuit* is of primary importance. It seems that it should be dwelt with early in the course and covered rather thoroughly. It is the electricians' main tool. The writer calls the course in which circuits are taught in connection with lighting and signaling devices, "Circuits, Switching, and Materials."

There is hardly another shop subject where such a vast wealth of teaching material exists as in the subject of electricity. It contains teaching matter in such profusion as to be almost bewildering. There is such an array of interesting things within the teacher's reach, that he is quite likely to be led down some relatively unimportant side road by his immediate interests. All are good, but the fact remains — the choice might not fit the needs of the locality nor be to the best interest of the student. The type and character of the community, the existing school equipment, the money available for new equipment and supplies, the background of the instructor, are all factors which must be reckoned with in making the all-important decision of what to teach.

It might be well to remember here that all courses bearing the electrical label are certainly not true electrical courses. For instance, electrical refrigeration is a trade by itself and has but little electricity in it. In this respect it might be compared to the electric shoe shop. No one thinks of that as being electrical, and yet a motor drive is used as the driving power in both.

Keep the course down to fundamentals, shaped, perhaps, to meet local needs. Projects are good in their place. They, however, should be used only when they illustrate a desired point and when they are of some value when completed. Again, compromise may have to enter here.

Radio? Yes, if the community needs it. Not, however, unless there is a separate course in a room apart from other electrical activities. Radio courses do not mix well with the rest of the course. In its more advanced stages radio work requires rather complete concentration of thought and complete absorption by the instructor, in the work of a student or two. It is then that others of the class have a chance to get out of control. Certainly this is not to be desired. A teacher in charge of any class should know just about everything that is going on in a classroom at all times — and that, obviously, is just about the opposite of concentration.

Nor should radio be encouraged for the benefit of the occasional radio *bug* among the students. According to the writer's personal experience gathered over a long period of time, the average student radio *bug*, although he knows all the jargon, is about the sloppiest workman in the class. He is also hard to keep on the job, and he is usually one of the poorest thinkers. While there are, of course, exceptions to this, electrical teachers are asked to keep track of boys of this kind over a period of a few years and form their own conclusions.

A shop class demands individual instruction. The teacher ought to be in a dozen places at once, and a class will get out of control if he is not a jump or so ahead of the troublemakers. The problem is to keep each student busy all the time at a job which is both interesting and educational. While this is an ideal to hold to, it really can be approached rather closely if the courses are carefully prepared with this end in view.

It seems that the best conducted shops are those in which the teacher spends his time surveying the class as a whole. He will, perhaps, answer a question now and then, but in the main the students seem to be going it alone in their work. If the boys are busy working, this teacher has no doubt done a good job of teaching. But if that teacher spends any considerable time with his head down at one bench, it is easy to venture that the class will not be long at work. It is far better for him to call some other student who has the information to do the explaining on a particular job and to put him to work straightening out on the boy who needs help, while the teacher keeps control of the class. The youngster who has been commandeered to assist the instructor will strengthen his own knowledge about the particular item which he is explaining, while the fellow who needs the

(Continued on page 30A)

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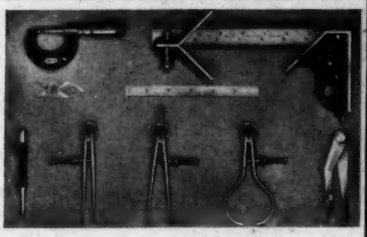
STARRETT

PRECISION TOOLS - EDUCATIONAL SETS - HACKSAWS



Starrett Catalog No. 26-CE shows many kits and separate tools designed especially for vocational training use. Write for a copy.

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World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled—Steel Tapes, Standard for Accuracy—Dial Indicators for Every Requirement

Standardize on

(Continued from page 29A)

help will most likely pick up the information more quickly from one of his companions than from the instructor. Why? That is hard to say, but it is that way. Perhaps the student realizes the instruction actually is down to his level if his classmate has acquired the knowledge which he is craving to get. Perhaps, too, he is ashamed to let his pal outstrip him on a job and so his pride is aroused to call forth an extra effort on his part.

The writer has always made it a point to size up a class so that the first job of a new unit in a course will fall to a student who is most fitted for it. When this boy understands the theory and knows how to do the job, he is appointed to the next boy to get started. The teacher then has two assistants. By the time the class is ready for this unit it is no longer a new and untried thing, but one which will almost carry itself along.

To a certain extent, the work can be arranged in such a way that the demand for the mathematics and related work that goes along with the job is asked for by the students. At least it should be held back until the job is ready and need for the related work is apparent.

When groups of teachers get together in the sectional meetings at conventions and round tables, there are always those who ask, "Where should we begin?" "What ought we to teach first?" It is indeed a problem. There is so much material that it obviously cannot all be taught. Then comes the necessity to decide what must be left out. Since electrical circuits are so important, it is quite common to adopt circuits as the starting point. But teaching circuits, if the work is to have its full value, must be more than the simple hooking up of bells and lights. This type of circuit work has its place in illustrating certain problems, but do not depend upon it too much for its simple surface value. Rather let us use these circuits for their value as a vehicle to get across instruments, measurements, formulas, and understanding. A circuit to be measured has to contain something measurable. Lights are better than bells for this.

Since students, at this stage, still have rather clumsy hands and unco-ordinated minds, why not let them use low-voltage lamps and inexpensive meters. These youngsters are not yet at the age where extreme accuracy is the all-important thing, and the inexpensive meters from the radio supply houses are accurate enough and cost but a fraction of the price asked for standard laboratory meters. Advanced classes use these better meters, but the beginning students should use this cheaper variety.

Series and parallel circuits can then be used to clear up that all-too-vague idea as to voltage, current, and resistance relations in them.

Electricity is truly different and difficult. Starting with circuits, the student is ready for these new units; the volt, the ampere, and the ohm. Many pupils have never heard of them before. Besides they are now dealing with a subject in which they cannot identify what they learn in the accustomed manner — that is, *with the eyes*. That in itself places them at a disadvantage. Then, too, there are these new units and names. How many teachers have struggled for shades of meaning in these definitions while searching for the light of understanding in the eyes of the class?

Electrical teachers, therefore, are confronted with a real challenge to spur them to do better teaching. Furthermore, theirs is a subject to be proud of, one which permeates into every fiber of modern living, ready instantly to be of service to mankind.

Answers to Questions

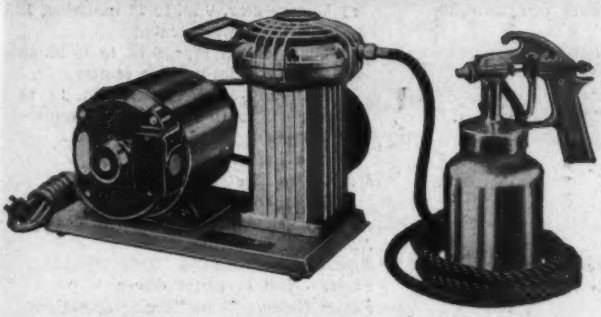
UNDERCOATING FOR ENAMEL

1033. Q.: Ordinary enamel undercoat does not seem to be especially good from the standpoint of surface, adhesion, etc. How would it be to use the more opaque outside house paints that carry considerable titanium for this purpose? It seems to me that the paint is the better material and it seems that it should cover nearly as well. — *H. H. R.*

A.: Theoretically your idea might hold water, practically it is not worth considering. In the first place, you cannot have a relatively soft undercoating as your paint would be for a relatively hard material like the enamel will

(Continued on page 40A)

BETTER AND FASTER FINISHING FOR SCHOOL WORKSHOPS



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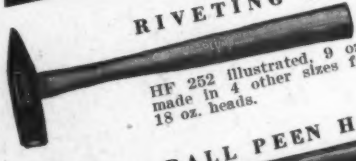
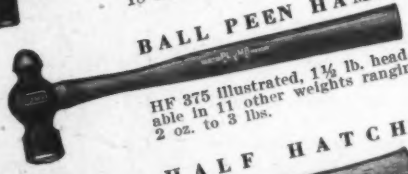


HF 252 illustrated, 9 oz. head. Also made in 4 other sizes from 4 oz. to 18 oz. heads.

BALL PEEN HAMMERS



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2902 Illustrated, 1 lb., 5 oz. head. 3⅝" bit. Made in 2 other sizes.

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Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Air Compressors — for machine shop, foundry, or forge shop
Anvil — 100-lb.
Arbor Press — bench or pedestal type
Barrows
- *a*) Coke
- *b*) Foundry
- *c*) Scrap

Belt Lacer
Benches
- *a*) Coremaking
- *b*) For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
- *c*) Molding

Blackboard — permanent or portable
Blowers — for furnaces, forges, etc.
Blowtorch — 1 qt. size
Bookcase — for reference books, catalogs, etc.
Boring Bar
Boring Mill — vertical or horizontal
Bulletin Board
Cabinets — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
Casehardening Boxes
Centering Machine
Chain Hoists — differential, duplex or triplex
Chairs — teacher's and tablet-arm, if needed for related-subjects room, or for demonstration section
Chuck
- *a*) Drill, selected sizes
- *b*) Lathe, combination, 4-jaw, selected sizes
- *c*) Lathe, independent, 4-jaw, selected sizes
- *d*) Lathe, universal 3-jaw, selected sizes
- *e*) Milling machine, universal

Core Oven — for foundry
Cranes and Hoists — air, electric or hand, of the jib, traveling, or portable type
Cupola — for foundry, coke, or electric, ¼ to 1-ton capacity
Desk — teacher's, with drawer compartments
Die-Filing Machine
Dividing Head
Drills
- *a*) Bench, hand
- *b*) Breast
- *c*) Electric, portable
- *d*) Hand
- *e*) Post, hand or power
- *f*) Radial
- *g*) Sensitive
- *h*) Upright, power

Flasks — 2 or 3 part, steel or snap type
Forge — coal or gas, with hand or electric-driven blower
Furnaces
- *a*) Annealing
- *b*) Bench
- *c*) Brass and soft metal
- *d*) Combination bench
- *e*) Casehardening
- *f*) Cyanide
- *g*) Gasoline
- *h*) Heat treating
- *j*) Melting

Gear-Cutting Machine
Grinder
- *a*) Bench, hand or power driven
- *b*) Combination grinder, buffer and polisher
- *c*) Emery, bench or pedestal type
- *d*) Face, with magnetic chuck
- *e*) Portable tool post
- *f*) Precision, for external and internal grinding
- *g*) Universal tool cutter, drill and reamer grinder
- *h*) Wet tool

Hack Saw — motor or belt driven
Hand Picks — for cleaning inside of cupola, 1¼ to 2½ lb.
Hardness Testing Machine
Lathes — belt or individual drives
- *a*) Automatic
- *b*) Bench, 6 in. to 11 in. swing, 11 in. to 36 in. between centers
- *c*) Change gear, 9 in. to 14 in. swing, 18 in. to 36 in. between centers
- *d*) Quick-change gear, 9 in. to 16 in. swing, 18 in. to 36 in. between centers
- *e*) Semiquick-change gear, 9 in. to 18 in. swing, 18 in. to 42 in. between centers
- *f*) Turret
- *g*) Metal spinning

Milling Machine
- *a*) Plain, cone or motor-driven type
- *b*) Universal, cone or motor-driven type

Nibbling Machine
Pipe Cutter
Planer — belt or motor driven
Power Hammer — for forging operations
Punches — metal, hand, or power
Pyrometer
Pyroscope
Relieving Attachment for Lathe
Sand Sifter — for foundry, hand or power
Sandblast Outfit — with cabinet
Scale
- *a*) Counter for machine shop
- *b*) Platform, for foundry, 1000-lb. capacity

Shaper
Snap-Flask Jackets — to fit snap flasks used
Straightening Press
Surface Plates
Swage Block and Stand — for forge shop
Taper Attachment for Lathe
Truck — warehouse
Tumbling Barrel — for foundry
Vises
- *a*) Blacksmith
- *b*) Drill press
- *c*) Machinist
- *d*) Pipe
- *e*) Planer
- *f*) Shaper

Welding Outfit
- *a*) Acetylene
- *b*) Electric

Metalworking—Small Tools

Arbors
- *a*) Drill chuck to suit requirements
- *b*) Reamers, various sizes
- *c*) Shell tool, various sizes
- *d*) Straight shank for shell reamers and shell drills, selected sizes
- *e*) Taper shank for shell reamers and shell drills, selected sizes

Bearing Scraper
Bellows — for foundry class
Bevel Protractor
Brooms and Floor Brushes — for shop and foundry
Brushes
- *a*) Bench
- *b*) Core box
- *c*) Core painting
- *d*) Hard brushes for foundry
- *e*) Floor
- *f*) Soft brushes for foundry

Bulb Sponges — for molders
Draw Pins — for molders
Calipers
- *a*) Hermaphrodite, 4 in. and 6 in.
- *b*) Inside, 4 in. and 6 in.
- *c*) Outside, 4 in. and 6 in.

Cans
- *a*) Oil, 1/3-pt., 1-pt., and 10-gal.
- *b*) Waste

Center Testers
Chisels
- *a*) Cape, 3/8 in. and 5/8 in.
- *b*) Cold, 5/8 in. and ¾ in.
- *c*) Diamond point, 3/8 in. and ½ in.
- *d*) Round nose, 3/8 in. and ½ in.

Clamps.
- *a*) 4 in., 6 in., 8 in., and 10 in.
- *b*) Flask, for foundry
- *c*) Strap, various sizes

Coke Forks — for foundry
Collets
- *a*) For milling machine, selected sizes
- *b*) For lathe, selected sizes

Combination Squares — with hardened head and blade, and protractor head, 9 in. and 12 in.
Counterbores — straight and tapered shanks, selected sizes
Countersinks — for metal
Crucible Tongs — to fit crucibles
Crucibles — selected sizes
- *a*) Shanks, single-end to fit ladles
- *b*) Shanks, hand, to fit ladle bowls

Cutters — angular-milling, bevel-gear, concave-milling, convex-milling, end-milling, face-milling, formed-milling, grooving, involute gear teeth, key-seat, side-milling, and metal-slitting
Dividers — Spring, 4 in. and 6 in.

(Continued on page 38A)

Modern-Safe - THE USUAL CHOICE OF EDUCATIONAL INSTITUTIONS . .

IN milling machines the usual choice of engineering colleges, technical high schools and vocational schools is **MILWAUKEE**—noted for their built-in safety, modern design, with all the features used in modern milling machine practice.

Centralized controls, with built-in safety interlocks, make it impossible to throw in power controls when hand controls are engaged—machines are adapted to all educational needs and the most inexperienced operators. Write for bulletin No. 735.

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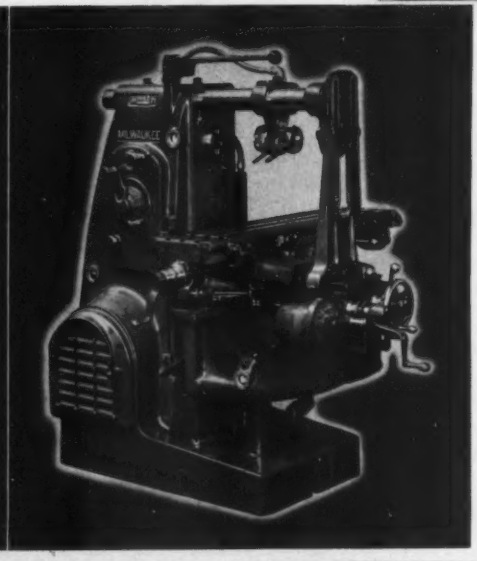

Model 1-H and 2-HL, Universal Type

(Left) Finger-touch saftey controls . . . the famous K & T Double Overarms . . . directional feed levers . . . plus other perfected features.

Model 1-H and 2-HL, Plain Type

Right) Compact, complete — with all tried and tested features usually found only in larger machines . . . low in height . . . minimum floor space . . . full back column . . . centralized controls.

MORE THAN *41 years* OF DOING ONE THING WELL

K&T

Milwaukee MILLING MACHINES

(Continued from page 36A)

Drill
- *a*) Drifts, different sizes
- *b*) Drill sleeves, different sizes
- *c*) Stand for Nos. 1 to 60
- *d*) Stand for 1/16 in. to ½ in. by 64ths

Drills
- *a*) Center
- *b*) High-speed, taper shank, various sizes
- *c*) Jobbers, straight shank, 1/16 in. to ½ in. by 64ths
- *d*) Ratchet
- *e*) Straight shank, Nos. 1 to 60
- *f*) Taper shank, ½ in. to 1 in. by 16ths

File Cards

Files
- *a*) Die sinkers, various shapes
- *b*) Flat bastard, 8 in. and 10 in.
- *c*) Half-round, double cut, 6 in., 8 in., and 10 in.
- *d*) Hand, smooth, 8 in. and 10 in.
- *e*) Mill, smooth, 8 in. and 10 in.
- *f*) Round bastard, 8 in.
- *g*) Square bastard, 8 in.
- *h*) Swiss, various shapes
- *j*) Three-square, double cut, 6 in.
- *k*) Warding, double cut, 6 in.

First-Aid Cabinet and Supplies

Forge Tools — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop

Gate Sticks — maple, for foundry

Gauges
- *a*) Center
- *b*) Depth
- *c*) Drill and wire
- *d*) Screw pitch, select kinds
- *e*) Surface

Gloves — asbestos, for foundry

Goggles
- *a*) For machine shop
- *b*) For foundry

Hack Saw
- *a*) Blades, hand, 18T, 10 in.
- *b*) Blades, power, 14T, 12 in.
- *c*) Frames, adjustable

Hammers
- *a*) Babbitt
- *b*) Ball-peen, 13-, 16-, or 20-oz.
- *c*) Blacksmith's, various kinds
- *d*) Riveting, 9- and 12-oz.
- *e*) Setting

Indicator
- *a*) Center
- *b*) Universal or universal dial test
- *c*) Speed

Knurling Tool — with assorted knurls

Ladles
- *a*) Bull
- *b*) Hand bowls
- *c*) Melting

Lathe Dogs — ½ in., ¾ in., 1 in., 1½ in., 2 in., 2½ in., and 3 in.

Leggings — fireproofed duck, to protect students when pouring in foundry

Level — 6 in. bench

Lifting Screws — for molders

Mallets — wood or soft

Mandrels — selected sizes

Micrometers — inside, 1½ in. to 8 in.; outside, 0 to 1 in.; outside, 1 in. to 2 in.; outside, 2 in. to 3 in.

Molding Boards

Molding Sticks and Trowels — various kinds

Nippers — end-cutting, 5 in.

Oil Storage Tank — with pump

Oilstones — medium and fine

Pails — galvanized, 12-qt. capacity for foundry

Parallels
- *a*) Adjustable
- *b*) Steel, assorted sizes

Pliers
- *a*) Combination, 6 in.
- *b*) Side-cutting, 6 in.

Punches
- *a*) Center, ¼ in. and ⅜ in.
- *b*) Hollow, ½ in., ¾ in., and 1 in.
- *c*) Pin, ⅛ in., 5/32 in., 3/16 in., 7/32 in., and ¼ in.
- *d*) Prick, ¼ in.

Rammers — for foundry
- *a*) Hand
- *b*) Floor

Reamers — various sizes
- *a*) Adjustable
- *b*) Hand
- *c*) Taper pin
- *d*) With taper shank

Riddles — ¼ in. and ⅜ in. mesh, 18 in. diameter, for foundry

Rivet Sets — assorted sizes

Scales
- *a*) Steel, 6 in., graduated 1/64 in. to ⅛ in.
- *b*) Steel, 12 in., graduated to 32nds

Screw Drivers — 6 in. and 9 in. blade

Scribers

Shovels
- *a*) Coke
- *b*) Sand

Snips — tin, 3 in. straight and 3 in. curved

Sockets — for taper shanks, drill and tools, selected sizes

Soldering Coppers and Handles — 1-lb. size

Spray Can — for molders

Sprinkling Cans — galvanized iron, 16-qt. capacity, for foundry

Sprue Picks — for molders

Squares
- *a*) Machinists', 6 in.
- *b*) Blacksmith's

Steel Figures, ⅛ in.

Steel Letters — ⅛ in.

Swabs — for molders

Tapeline — steel, 25 ft.

Taps and Dies
- *a*) Machine screws
- *b*) Pipe
- *c*) S.A.E. ¼ in. to ¾ in.
- *d*) U.S.S. ¼ in. to ¾ in.

Tongs
- *a*) Blacksmith's, various kinds
- *b*) Pick-up, for foundry
- *c*) Shake-out, for foundry

Tool Holders
- *a*) Boring tools
- *b*) Cutting-off tools
- *c*) Planer
- *d*) R.H. and L.H. offset shank
- *e*) Shaper
- *f*) Slotter
- *g*) Straight shank
- *h*) Threading

Tool-Holder Bits — square, ¼ in., 5/16 in., ⅜ in., 7/16 in., ½ in.

Trammel Points

V Blocks and Clamps

Wheel Dresser

Wrenches
- *a*) Adjustable, 8 in. and 10 in.
- *b*) Pipe, 8 in. and 12 in.
- *c*) Tap, adjustable, various sizes

Metalworking—Materials and Supplies

Abrasive cloth — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls from 1 to 28 in. wide

Abrasive Wheels

Acetylene Gas — in drums for welding

Aluminum
- *a*) Pigs for foundry
- *b*) Sheets, tubing, rounds, shapes, wire, etc.

Babbitt Metal

Bearing Blue

Belt Dressing

Belt Lacing Material

Belt Leather

Bolts
- *a*) Carriage, selected sizes
- *b*) Lag, selected sizes
- *c*) Machine, selected sizes
- *d*) S.A.E., selected sizes
- *e*) Stove, flat or round heads, selected sizes

Brass
- *a*) Bars, 3/32 in., ⅛ in., 4/16 in., and ¼ in. thick; ⅜ in. to 1 in. wide, 8 ft. to 10 ft. long, selected sizes
- *b*) Round rods, 3/16 in. to ½ in. by 16ths, selected sizes
- *c*) Sheets, 28 to 32 American gauge, 12 in. wide x 72 in. to 84 in. long, selected sizes
- *d*) Strips, 1/32 in. and 1/16 in. thick, ½ in. to 1½ in. wide, 50 ft. to a coil, selected sizes
- *e*) Threaded rods, Nos. 6 to 10, in 24 in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24 in. lengths, selected sizes
- *f*) Wire, soft, 8, 11, and 14 American gauge, selected sizes
- *g*) Wire, spring, 8 to 22 American gauge, selected sizes

Casehardening Compounds

Chaplets — single and double head

Coal
- *a*) Charcoal for foundry or forge
- *b*) Coke for foundry
- *c*) Forge

Copper
- *a*) Pigs, for casting alloys
- *b*) Sheets, 8 to 25 American gauge, 30 in. x 60 in., selected sizes
- *c*) Tubing, outside diameters, 3/16 in., ¼ in., 5/16 in., ⅜ in., ½ in.; thickness of wall, 1/32 in.; lengths, 8 ft. to 12 ft., selected sizes
- *d*) Wire, soft, 2 to 20 American gauge, in coils. Also in ¼-, ½-, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

Core
- *a*) Compounds
- *b*) Flour
- *c*) Paste
- *d*) Oil
- *e*) Wax-vent wire

Cutting Compounds

Fire Bricks and Clay — for foundry

Fire Handles — assorted sizes

(Continued on page 40A)

Lessons.... That Last a Lifetime

You can make them mean more with Atlas Machine Tools

Sound theory . . . exactness . . . patience . . . practical skill. These and many more of your lessons stay with a student all his life—help guide his development and mold his character. Atlas Machine Tools are designed to help you make these lessons mean more. They are thoroughly modern—they encourage smooth precision workmanship. But most important, say many leading educators, Atlas reasonable prices enable you to have *more* machine tools in your shop so that *more* students can have *more* time to develop their skills. We'll be glad to send you our latest catalog so you can make your own comparisons of costs, specifications, and the many extra features Atlas provides as standard equipment.

The Atlas SHAPER enables many schools, for the first time, to give complete metal shaping instruction. Priced at only $245 complete with safety guards less motor, this machine has all the performance features of large expensive shapers. Stroke is 7" —drive is standard bullgear type powered by V-belts from motor to spindle. 4 speeds. 5 surface feeds in either direction. Runs from ½ H.P. motor.

Atlas LATHES are rugged, accurate, powerful. The new F-Series 10" models have power cross feed as standard equipment. Complete V-belt drive, quick change countershafts, compact controls, precision-ground bed ways, custom-built spindle bearings, backgeared power—these are but a few of the many modern features at no extra cost. F-Series Lathes start at $99.75.

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LATHES · DRILL PRESSES · ARBOR PRESSES · SHAPERS

ADVERTISING PAGES REMOVED

(Continued from page 38A)

Graphite — for foundry
Iron — Pig, for foundry
Lacquer — transparent and colored, for finishing
Nuts — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds
Oil
a) Boiled linseed
b) Lubricating
c) Quenching and hardening
Packing
Round, sheet, square, or tubular
Paint — black asphaltum
Pins
a) Cotter, 3/32 in. to ¼ in. diam. from ½ in. to 2 in. long
b) Flask, for flask repairs
c) Taper, Nos. 0 to 6, ¾ in. to 2 in. long
Pumice Powder
Rivets
a) Copper, with burrs, Nos. 7 to 14, lengths, ⅜ in. to ¾ in., selected sizes
b) Iron, No. 14 gauge to 3/16 in., flat-head or button-head, ¼ in. to 1 in. long, selected sizes
c) Tinners', flat-head, 8-oz. to 16-lb., either tinned or black, selected sizes
Sand
a) Molding, in 350-lb. barrels or 800-lb. casks
b) Parting, in 350-lb. barrels or 800-lb. casks
Screws
a) Flat-head or round-head iron or brass, selected sizes and kinds
b) Cap and machine, iron or brass, selected sizes and kinds
c) Set, head and headless
Solder — acid or rosin core; bar, or solid wire
Soldering Paste or Salts
Steel
a) Bessemer, rod, 1/64 in. to ⅜ in. by 64ths, in 4 ft. lengths, selected sizes
b) Bars, cold-rolled, ⅛ in. to ⅜ in. thick, ½ in. to 2 in. wide, 12 ft. lengths, selected sizes
c) Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3 ft. lengths, selected sizes
d) Rods, hexagon and square, cold-rolled, ¼ in. to ¾ in., in 12 ft. lengths, selected sizes
e) Round, cold-rolled, diameters ⅛ in. to 1 in., lengths 12 ft., selected sizes
f) Sheet, black, Nos. 18, 20, 22, 24, 26, 28 U.S. gauge; size of sheets, 24 in., 28 in., and 30 in. x 96 in.
g) Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28 U.S. gauge; size of sheets, 24 in., 28 in., and 30 in. x 96 in., selected sizes
h) Threaded rods, Nos. 6 to 10, in 12 in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24 in. lengths, selected sizes
Tin
a) Pigs, for casting alloys
b) 1C, 1X, 20 in. x 48 in.
c) 1XX, 20 in. x 48 in.
Washers and Burrs
a) Copper, burrs, Nos. 3 to 14, in 1-lb boxes
b) Iron burrs, Nos. 3 to 14, in 1-lb. boxes
c) Brass washers, 3/16 in. to ½ in. by 16ths
d) Iron washers, 3/16 in. to ½ in. by 16ths
Welding Fluxes
Welding Rods (all rods come in 24 in. lengths)
a) Brazing, 1/16 in., ⅛ in., and 3/16 in. diameter
b) Cast aluminum, 3/16 in., ¼ in., and ⅜ in. diameter
c) Cast brass, 3/16 in., and ⅜ in. diameter
d) Cast bronze, ¼ in. diameter
e) Cast copper, 3/16 in. and ¼ in. diameter
f) Cast iron, 3/16 in., ¼ in., 5/16 in., and ⅜ in. diameter
g) Low carbon steel, ⅛ in., 3/16 in., and ¼ in. diameter
White Lead — for machine shop
Wire
a) Annealed, 16 to 34 English gauge, selected sizes
b) Coppered market, 5 to 18 English gauge, selected sizes
c) Coppered spring, 2 to 18 English gauge, selected sizes
d) Galvanized, 5 to 18 English gauge, selected sizes
e) Piano, Nos. 00 to 36, selected sizes
f) Tinned, 16 to 24 English gauge, selected sizes
g) Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes
Zinc
a) Pigs, for casting alloys
b) Sheet, Nos. 4 to 14, sheets 36 in. x 84 in.

(Continued from page 30A)

become in a short drying time. Enamel, of all finish coats, must have a hard and unyielding foundation.

For this purpose, prime your work with a well-brushed-out coat of good floor varnish, 4-hour type. Let dry hard and sand smooth with a No. 4/0 garnet finishing paper moistened on the back to increase flexibility of the paper. Dust off and apply a coat of high-grade undercoater of the same brand as your enamel; dry hard and resand. Dust off and apply a coat of one-half undercoater and one-half enamel well strained. Dry hard and resand with 6/0 speed-wet and water. Dry and recoat with full-bodied enamel. Dry hard and water-rub with FFF pumice stone and felt pad in water. Dry off and polish. This is the ideal job. Make it as short as you wish after the first primer coat by using two coats of finish enamel, which are necessary for durability. A high-grade, first-quality 4-hour enamel should give you fine coverage in two coats and still water rub. Under no circumstances use shellac of any kind as an undercoater if you wish to avoid checking later on. — *Ralph G. Waring.*

Storing Plywood

1054. Q.: How can I keep stored plywood from warping? — *H. H. D.*

A.: Plywood should be stored in a dry room, and it should be piled solidly, the top piece being covered with a rejected panel on which weights have been piled. The reason for the weights is that the top piece would have a tendency to curl because one side is exposed to the air and would dry out. It is also advisable to turn the rejected top panel over at intervals. Stored this way there will be little likelihood that the panels will warp. Algoma Plywood and Veneer Co.

Finishing Cement Floors

1055. Q.: Our recreation-room floor of red cement, laid about a year and a half ago, and varnished about two months after laying, was badly flooded with water. This resulted in the floor becoming streaked, the varnish in certain spots becoming very sticky. Scrubbing the floor with a sal-soda solution — a handful of sal soda to a pail of water removed the sticky varnish, but there is still a lot of varnish left in spots and now I am wondering how I can refinish this floor. Can you help me? — *J. C.*

A.: This cement floor should have originally been first washed with zinc-sulphate solution at the rate of three pounds per gallon of hot water. After having been thoroughly dried the caustic spots here and there would have then been neutralized. The fact that this was not done accounts for the partial dissolution in certain areas later on.

Under the present circumstances it will be best to strip the floor entirely by dissolving one pound of kitchen lye as sold in the grocery stores, in one gallon of double-strength boiled laundry starch. Be sure the hands and wrists are well greased with vaseline, and then wear rubber gloves and overshoes as well. Mop on the lye solution freely with an old stubby broom, allow to remain until the finish has softened, loosen up carefully with the broom again; then mop up with plenty of clean water. Let stand overnight and then proceed with the zinc sulphate being very sure that no portions are missed. Dry one week with plenty of ventilation and then varnish or floor enamel as desired. Be sure the floor is hard before using it. — *Ralph Waring.*

Finishing Rush Seats

1066. Q.: Will you please tell me the best way to finish rush, used for chair seats?

A.: Rush is a fine, durable seat material of great flexibility for which reason hard, brittle finishes of shellac or lacquer should be avoided. The only answer, therefore, is a tough, durable material like a high-grade floor varnish. The first coat on the rush seats should be lightly brushed on or sprayed and should consist of one-half turpentine and one-half varnish. If brushed, stroke from the diagonal lines to the edge of the frame and parallel to the weave avoiding crossbrushing at any time. Let dry at least one week in a warm room and give a second coat of full-bodied stock brushed out carefully and evenly so as to avoid any tendency to load the weave. Dry in heat one week and put in service. At a later date, if renewal is necessary, scrub thoroughly with Ivory soapsuds and brush; rinse clean with clear water; dry completely in heat and revarnish with one full-bodied coat. — *Ralph Waring.*

New Publications

Artistic Metalwork

By A. F. Bick. Cloth, 236 pages, 7¾ by 10¼, illustrated. Price, $3. Published by The Bruce Publishing Co., Milwaukee, Wis.

A book written by a craftsman, designer, and artist. Numerous sketches, drawn by the author, explain clearly how metal may be cut, shaped, engraved, chased, etched, riveted, soldered, brazed, welded, cast, and finished.

There are 59 projects, all of them depicting objects that are out of the ordinary and all correct from the designer's viewpoint.

Modern Furniture Making and Design

By Rodney Hooper. Cloth, 160 pages, 6¼ by 9¾, illustrated. Price, $4. Published by The Manual Arts Press, Peoria, Ill.

This book, first published in England under the title, *Woodcraft in Design and Practice*, deals largely with the design of furniture for the home and garden.

It is well illustrated both with zinc cuts made from pen-and-ink sketches and drawings, and halftones made from photographs of the finished pieces. In practically all cases, the working drawings present a number of alternative designs to encourage the student in attempting designs of his own.

The book contains seven chapters among which the subject matter has been divided as follows: I. Furniture Design and Decorative Treatment. II. Furniture as a Part of the Decorative Scheme.

(Continued on page 43A)

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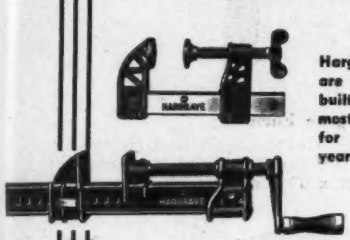

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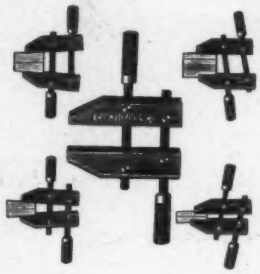

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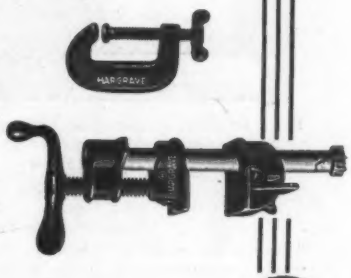


THE CINCINNATI TOOL COMPANY

Waverly and Main Aves. ESTABLISHED 1879 Cincinnati, Ohio

(Continued from page 40A)

III. Furniture for the Living-Room and Dining-Room. IV. Furniture for the Bedroom. V. Furniture for the Garden. VI. Garden Items in Cast Concrete. VII. Woodwork for Schools.

Birdhouses

By Paul V. Champion. Cloth, 96 pages, 6¼ by 9¼, illustrated. Price, $1.25. Published by The Bruce Publishing Co., Milwaukee, Wis.

A birdhouse book written by a shop teacher who not only knows and loves birds, but also has in mind that students can be imbued with the same feelings toward these little colorful and tuneful feathered friends of humanity.

The book contains 26 plates, each of which gives the fully dimensioned details for building a home which some bird will cherish. The material used in most cases, can be had for the asking — lemon and orange crates, apple boxes, and the like.

The houses described are for wrens, bluebirds, martins, robins, tree swallows, flickers, woodpeckers, chickadees, titmice, and nuthatches.

There are also notes on how to attract birds and how to provide them with food and feeding shelters.

Automobile Electrical Repairs

By E. Alber. Cloth, 108 pages, 5 by 7½, illustrated. Price, $1.50. Published by Chemical Publishing Co., New York, N. Y.

A book giving precise directions for checking through the electrical system on the automobile, in order to establish the exact part that has ceased to function.

The content covers the following: Battery Repairs, Dynamo Repairs, Starter Circuit Repairs, Magneto Repairs, Coil Ignition Repairs, Rewiring of Circuits, General Testing Method, and Useful Tables and Gauge Sizes.

Diesel Engines — Theory and Design

By Howard E. Degler. Cloth, 270 pages, 6 by 8½, illustrated. Published by American Technical Society, Chicago, Ill.

This book is specially intended to be used as a textbook or as an aid to designers and draftsmen. It covers the thermodynamics as well as the theoretical considerations necessary in designing the engine parts, valve gears, and the like.

The book is replete with technical formulas, their application being made clear by many examples. There are many illustrations and diagrams.

The reference table for worked examples at the end of the book is particularly useful.

Furniture for the Amateur Craftsman

By Earl Harmes. Cloth, 79 pages, 9 by 11⅞, illustrated. Price, $2.25. Published by The Bruce Publishing Co., Milwaukee, Wis.

A fine selection of beautifully designed pieces of furniture embracing colonial as well as modern pieces.

Each piece is pictured by a halftone, an assembly, and from one to three plates of details. The author literally presents each piece in knockdown form so that even the veriest tyro can follow the illustrations and make the separate pieces required to produce a beautiful and worth-while whole.

There are also helpful suggestions for the amateur craftsman, notes on construction and finishing, and information on the various woods commonly used in furniture making of this kind.

Personal News

♦ Dr. Charles Allen Prosser, director of William Hood Dunwoody Institute, Minneapolis, Minn., was appointed consultant on vocational work to the National Youth Administration. As consultant, Dr. Prosser will advise on further development and betterment of N.Y.A. work programs for out-of-school unemployed youths.

♦ Dr. Verne C. Fryklund of Wayne University, Detroit, Mich., addressed the teachers of Wichita Falls, Tex., on January 29, 1940. The subject of this address was, "The Great Provider." On January 30 he addressed the Dallas Vocational Guidance Association choosing for his subject, "The Junior College Confronts Youth."

As announced in the February, 1940, issue of Industrial Arts and Vocational Education, Dr. Fryklund was elected president of the National Association of Industrial Teacher Trainers at the A.V.A. Convention at Grand Rapids. The news note rather erroneously stated that the National Association of Industrial Teacher Trainers is comprised of men especially interested in training teachers for industrial arts. As a matter of fact, these men train teachers for the entire gamut of industrial arts and vocational education.

♦ Mr. Woodrow Turner, teacher of distributive occupations in the Fort Smith, Ark., Senior High School, has been granted a leave of absence from the second semester. He will be connected with the state department of education in Little Rock, Ark. Most of his time will be devoted to organizing and supervising evening schools at Little Rock and Hot Springs.

♦ Mr. Ralph Blair of Lamar, succeeds Mr. Turner. For about four years Mr. Blair did vocational teaching in El Dorado schools, but more recently has been connected with one of the NYA schools near Morrilton. He is a former student of the College of the Ozarks at Clarksville, Ark., and of the University of Florida.

♦ Mr. John Rogers, who formerly taught at the State Trade School, Putnam, Conn., has been appointed as instructor at the Rising Sun School of Aeronautics, Philadelphia, Pa.

♦ Mr. Ed Williams of Agricultural and Mechanics College, College Station, Tex., was elected as secretary-treasurer of the National Association of Industrial Teacher Trainers at the last A.V.A. convention held at Grand Rapids, Mich.

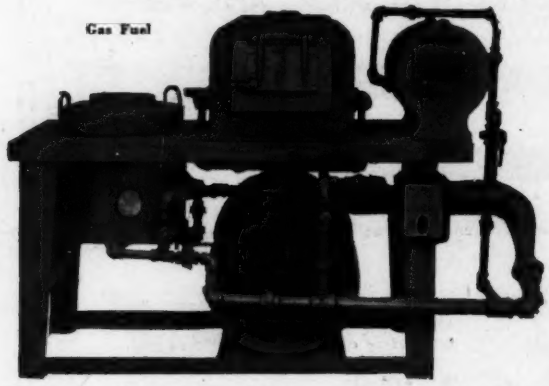
(Continued on page 56A)

FURNACES STEWART FORGES

The furnaces and combinations here shown are just several of a variety designed and developed for the school shop

Stewart Triple Purpose Furnaces

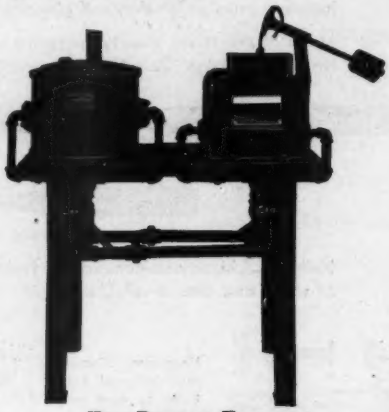
Gas Fuel



These series of combination furnaces are compact and very popular for educational purposes—an assembly of three types of our Stewart Standard Furnaces

Crucible Section
Oven Section
Forge or High Speed Section

These units make a complete plant covering practically the whole range of heat treating. Write for particulars.



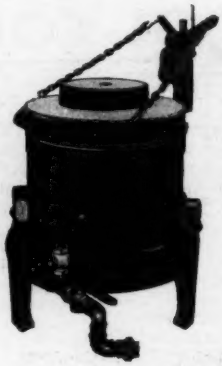
Two Purpose Furnace

Excellent for lead hardening or other liquid heat hardening. Can be used for melting soft metals. Is fitted with Stewart pressed steel pot 6" diameter x 6" deep or 6" diameter x 8" deep.

No. 12A Metal Melting Furnace

A sturdy efficient melting furnace having a capacity of 36 lbs. Brass, is fitted with a No. 12 Graphite crucible and lined with first quality refractories. Swinging top made of one piece of molded refractory, banded to add strength, lifts easily from body by means of a special mechanism which swings cover to one side, giving a clear opening into body of furnace.

Floor space.....24" x 24"
Shipping weight.....435 lbs.

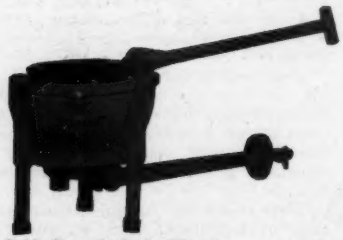


Gas Fuel

No. B68 Round Pot Furnace

This bench type unit is equipped with a 6" diameter x 8" deep pressed steel pot for lead or salt hardening. Can also be used for oil tempering. Lined with heavy refractories and fired so that no flame strikes the pot direct.

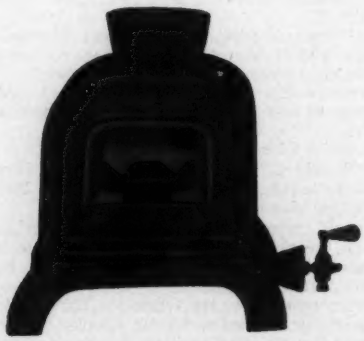
Height .....19"
Bench space .....20"x24"
Shipping weight .....170 lbs.



No. B40 Bench Soft Metal Melting Furnace

Although small in size, this unit has a capacity of 40 lbs. of lead. Suitable for the melting of any soft metals. Cast Iron shell, lined with insulation, and fitted with a cast iron pot with handle for removing and pouring.

Atmospheric Burner.
Pot.....6" diameter x 5" deep
Bench space.....12" x 20"
Height .....10"
Shipping weight .....55 lbs.



No. 4A Bench Metal Melting Furnace

This melter is fitted with a No. 4 Graphite crucible, lined with heavy firebrick and fitted with a swinging cover for the melting of brass, copper, and aluminum. Fast, quick heats assured.

Height .....19"
Bench space .....20" x 24"
Shipping weight .....180 lbs.

No. 2M Combination Soldering Iron Heater and Melting Pot

A very compact, sturdy and efficient gas heater for Soldering Irons. The flame is projected upward from the bottom and surrounds the irons, heating them rapidly and uniformly. Heavy cast iron body, lined with heavy firebrick. Retains the heat and does not burn out.
Pot on top for melting soft metals.
Will accommodate two 4-lb. irons.

Floor space.....16" x 11"
Atmospheric or blast burners
Shipping weight.....100 lbs.

51 Years Making Quality Industrial Furnaces

No. 152 Forge
Ideal for Small Work

This unit is very handy and one that can be placed conveniently on a bench or small table for the heating of small pieces to be forged, for the heating of rods for bending, for tool dressing, and for the taking of end heats. It has a small opening at both ends so that center heats can be taken or it can be worked from both ends. Ideal where a quick intense heat is required. The top is removable so that a wide variety of work can be handled.

Entrance.....1¼" x 1¼"
Bench space.....12" x 12"
Overall height .....15"
Shipping weight.....60 lbs.

There is a Stewart Furnace for every heat treating requirement.

Ask us for your copy of our Stewart wall chart of S.A.E. steel specification.

SK 248 Forge

A well built forge designed for tool dressing, rod end work, heating for bending, welding, the taking of center heats, and many other purposes where a fast high heat is required. Fitted with air curtain in front to protect the operator and equipped with a proportional gas and air mixer and a quenching tank with rack for tongs.

Opening .....4" wide x 2" high
Heating depth .....8"
Rear opening.....3" diameter
Shipping weight.....450 lbs.

Stewart Standard Ovens

Indirect heat and equipped with a U-shaped hearth slab so that no flame comes in a direct contact with the work. Will handle a wide variety of work, such as annealing, carburizing, tool and die hardening, and general heat treating suitable for temperatures up to 2000 deg. Fahr.

STANDARD SIZES
5" wide x 9" high x 13½" deep
and larger

No. 51 Bench High Speed Oven

This small under-fired furnace signed for high speed steel hardening where quick, high heats are essential has a carbofrax U-shaped hearth and no flame can strike the work direct. Suitable for temperatures of 2450 deg. Fahr. Built of Stewart quality throughout.

Opening .....3" high x 5" wide
Heating depth .....6"
Bench space.....20" x 13"
Shipping weight.....200 lbs.

Stewart No. 28 Bench Oven

Here is a very handy furnace for general shop work, lined with heavy first quality refractories and of the under-fired type, for the heat treatment of carbon and high speed steel. Fitted with U-shaped hearth. Adapted to annealing, carburizing, tool and die hardening, and general heat treating.

Opening.....4" high x 8" wide
Heating depth .....12"
Bench space.....24" x 24"
Shipping weight .....550 lbs.

Accredited Representatives and Dealers

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Atlanta, Georgia

Wessendorff, Nelms & Co.
317 Preston Ave.
Houston, Texas

For complete specifications and catalogs, write

CHICAGO FLEXIBLE SHAFT COMPANY, 5529 W. Roosevelt Road, Chicago, Illinois
Stewart Industrial Furnace Division

Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Air Compressor
- a) 3 to 4 cu. ft., with tank, piping, and motor
- b) Small portable, 1 cu. ft., with motor

Aligning Jig — for connecting rods
Anvil
- a) No. 100 or No. 125
- b) Rim

Armature Growler and Tester
Axle Stands
Battery Equipment
- a) Cell tester, panel type with discharge rack
- b) Charger (15-battery size) with rack
- c) Charger (6-battery size)
- d) Gas stove (small)
- e) Lead-burning torches, with gauges and piping
- f) Plate racks

Bench
- a) Electric test, elaborate
- b) Electric test, simple
- c) Work, with vises
- d) Work, portable with vise

Blackboard
Blowtorches — 1-qt. size
Bookcase
Brake
- a) Adjusting stand
- b) Band-lining machine

Bulletin Board
Cabinets
- a) Wood or metal, for bolts and supplies
- b) Wood or metal, for filing job sheets and correspondence

Chain Hoist — with overhead trolley and track
Chairs
- a) Teacher's
- b) For tables, or with tablet arms

Crane — portable
Crankshaft Truing Tool
Creepers
Desk — teacher's
Drill
- a) Breast
- b) Hand
- c) Electric portable, ½ in.
- d) Electric portable, ¼ in.
- e) Press, 21 in., with motor and chuck

Dynamometer — electric
Forge — with blower and tools
Furnaces — gas
Grease Dispensers
Grinder
- a) Cylinder with motor
- b) 8 in., with motor
- c) 12 in., with motor

Hones — cylinder
Jacks
- a) Lever, 1½-ton
- b) Floor, roller

Lathe
- a) 11 in. x 4 ft., with motor, chucks, and attachments
- b) 16 in. x 6 ft., with motor, chucks, and attachments

Press
- a) Arbor
- b) 30-ton

Spray Painting Outfit
Valve Refacing Machine
Vulcanizer
- a) Electric steam for tube work
- b) Small, hand

Welding Outfit — with tanks, gauges, and cutting torch
Wheel Alignment
- a) Gauge
- b) Test table

Automotive Shop—Small Tools

Abrasive — rubstone for cleaning castings in foundry
Alcohol Tester
Battery
- a) Cell tester, prod type
- b) Cell tester, cadmium
- c) Clips, large
- d) Element pullers
- e) Fillers
- f) Funnels, glass
- g) Hydrometer, acid
- h) Knives
- j) Post builders
- k) Post drills
- l) Post markers
- m) Separator trimmer

Bits
- a) Expansive
- b) Ratchet brace
- c) Wood, 3/16 in. to 1 in.

Bolt Cutter — 24 in. and 36 in.
Calipers — 6 in. inside and outside
Cans
- a) Oil, 1/3-pt.
- b) 1-gal., gas, safety
- c) 5-gal., gas, safety
- d) 5-gal., kerosene
- e) Waste

Checks — tool, 1,000, blank
Chisels
- a) Cape, 3/8 in. and 5/8 in.
- b) Cold, 3/8 in., 5/8 in., 3/4 in., 1 in.
- c) Diamond-point

Combination Squares — 12 in.
Cotter-Pin Extractor
Dividers — 6 in. and 10 in.
Drill Sets
- a) 1/32 in. to ½ in., by 64ths
- b) ½ in. to 1¼ in., by 32nds

File Cards
File Handles — assorted
Files
- a) Flat bastard, 6 in., 8 in., 10 in., and 12 in
- b) Half round, 6 in., 8 in., 10 in., and 12 in.
- c) Mill, 6 in., 8 in., 10 in., and 12 in.
- d) Round, 6 in., 8 in., 10 in., and 12 in.
- e) Square, 8 in., 10 in., and 12 in.

Fire Extinguishers — Pyrene and Acid
First-Aid Cabinet and Supplies
Floor Brushes — 18 in.
Funnels — tin, assorted sizes
Gauges
- a) Air pressure
- b) Center
- c) Depth
- d) Thread
- e) Thickness

Glass Cutters
Goggles
Grease Guns — plain and pressure-type
Hammers
- a) Ball-peen, 4-oz.
- b) Ball-peen, 1¼-lb.
- c) Ball-peen, 2-lb.
- d) Lead
- e) Riveting
- f) Sledge, No. 12

Ladle
- a) 3 in. bowl
- b) 6 in. bowl

Lamps — extension, with reels
Lead Pot — gas
Magnet Charger
Meters — volt and ammeter test
Micrometers
- a) Outside, 0 to 1 in.
- b) Outside, 2 in. to 3 in.
- c) Outside, 3 in. to 4 in.
- d) Inside, 1½ in. to 6 in.

Molds
- a) Battery nut
- b) Battery post
- c) Battery strap
- d) Burning stick
- e) Lead hammer

Oilstone
Pipe Taps — ⅛ in., ¼ in., ⅜ in., and ½ in
Pliers
- a) Combination, 6 in.
- b) Flat nose
- c) Round nose

Pullers
- a) Bearing
- b) Gear
- c) Wheel, hub type

Punches
- a) Center
- b) Taper pin
- c) Blacksmith

Putty Knives
Reamer — splindle bolt
Reamer Sets
- a) Piston pin, ½ in. to 1⅜ in.
- b) Taper pin
- c) Valve seat

Saws
- a) Hack, frames, 10 in., adjustable
- b) Hack-saw blades, 18, 20, and 24 teeth
- c) Hand

Scales
- a) Steel, 6 in., graduated 1/64 and 1/100 in.
- b) Steel, 12 in., graduated 1/32 in.

Scrapers
- a) Bearing
- b) Carbon

Screw Drivers
- a) 6 in. and 12 in.
- b) Small combination

Screw Extractors
Scribers
Snips — tin, 3 in. straight and 3 in., curved
Soldering Coppers — 1-, 2-, and 3-lb. with handles
Spring Spreaders
Stamps
- a) Figures, 3/16 in.
- b) Letters, 3/16 in.

(Continued on page 48A)

TEACH The VALUE of QUALITY

Molding shop students into true *craftsmen*—respecters of fine work, fine materials, fine *tools*—is the most important job any shop instructor can have. . . . You'll start your charges in the right direction by specifying Morse Cutting Tools. For wherever *quality* is honored, the name of Morse is known and honored . . . "There IS a Difference!"

MORSE TOOLS FOR THE SCHOOL SHOP

(*above*)

No. 302 Taper Shank Drill. Of selected carbon steel, for all power drilling not requiring high speed.

No. 330 Straight Shank Drill. So-called "Jobbers'" drill of carbon steel, for use in all types of hand drilling.

(*above*)

No. 602 Hand Reamer. Spiral Fluted, carbon steel reamer, ideal for general hand use in the shop.

No. 717 Expansion Reamer. Available in ¼" to 2" diameters. Its expansion feature makes it highly useful in school shop work.

No. 1045 Spiral Pointed Hand Tap. For machine tapping of most common materials in through holes. Furnished in plug style only.

No. 1184 Adjustable Round Die. In all sizes and threads, for hand thread cutting of commonly used metals.

Instructors and Superintendents Will Find The Morse Catalog A Valuable Guide To Fine Tools. Copies Will Be Sent Free To Those Officials, On Request.

MORSE TOOLS FOR THE ADVANCED OR AUTOMOTIVE SHOP

No. 1302 High Speed Taper Shank Drills. Tempered and designed for steady production work in power-drilling machines. All sizes, from ⅛" to 3" diameters.

(*above*)

No. 1683 High Speed Taper Pin Reamer. Helical Flutes. Taper ¼" per foot. Indispensable in any work where taper pins are used.

No. 1728 High Speed Adjustable Reamer. Six tapered blades slide lengthwise in the body slots, and are firmly held in position for the desired diameter.

No. 495 Combined Drills and Countersinks. Made of Carbon Steel, in all popular sizes and types, for drilling and countersinking center holes, or for starting holes at an angle.

No. 773 Screw Extractor. A very useful tool for removing pieces of studs, bolts or screws from holes in which they have broken off.

No. 1805 Heavy Duty End Mill. Coarse-toothed, spiral heavy-duty mill. Available in either right-hand or left-hand types.

No. 1809 Alternate Tooth Milling Cutter. Alternate teeth provide a shearing cut and ample chip clearance for deep slotting in tough metals.

No. 1040 Hand Tap. All popular sizes and pitches. Plug style illustrated.

No. 1145 Tap Wrench. Furnished in sizes 0 and 1, to handle all taps from 1/16" to 5/16", and reamers from 1/8" to 15/32".

For convenient, orderly, systematic arrangement of drills, Morse Drill Blocks and Drill Cases are ideal for the school shop.

MORSE THERE IS A DIFFERENCE TWIST DRILL & MACHINE COMPANY NEW BEDFORD - - - MASS., U. S. A.

THE MORSE LINE INCLUDES HIGH SPEED AND CARBON DRILLS - REAMERS - CUTTERS - TAPS and DIES - SCREW PLATES - ARBORS - CHUCKS - COUNTERBORES - MANDRELS - TAPER PINS - SOCKETS - SLEEVES

THIS IS STRICTLY UP TO YOU

You owe it to your boys to teach them the up-to-date, modern methods of hand-craftsmanship. That means supplying them with modern equipment. And when it comes to projects calling for solder, modern equipment means *cored solder.*

The finest cored solder is Kester Flux-Filled Solder.

It is the experience of teachers in schools the country over that boys do better, neater, faster work with this high quality solder with its self-contained flux. In all fairness to *your* boys, make sure that they get *their* chance to do these soldering jobs the best possible way—with Kester Flux-Filled Solder.

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Eastern Plant: . . . . . Newark, N. J.
Canadian Plant: . . . . . Brantford, Ont.

KESTER
FLUX-FILLED SOLDER

JOHNSON HI-SPEED HEAT-TREATING FURNACES GIVE 2500° F. IN FIREBOX

Bench or Pedestal Style
No. 70
$79.50
Carborundum Hearth is Standard Equipment

These furnaces are exeptionally practical for School purposes. Designed for heat-treating hi-speed steels; excellent for hardening punches, dies and tools. The most expensive and delicate high-speed tools heat uniformly and come out clean and scale free. May also be used for carbon and intermediate steels. Firebox linings are 2½" insulating refractory. Johnson burners under hearth. General Electric Motor furnished with Johnson Blower, which is made of cast iron housing and cast aluminum wheels. Front and rear openings for heating long bars and rods.

No. 70 Firebox: 9" long; 7¾" wide; 5" high
No. 120 Firebox: 13½" long; 7¾" wide; 5" high

Write for Catalog and List Prices

JOHNSON GAS APPLIANCE Co.
Cedar Rapids IOWA
522 E. AVENUE, N. W. ESTABLISHED 1901

(Continued from page 46A)

Tap-and-Die Sets
- *a)* Machine screw
- *b)* S.A.E. ¼ in. to 1 in.
- *c)* U.S.S. ¼ in. to 1 in.

Tire Tools
Tool Kit — metal box or canvas roll, empty
Twist Drills — (extra sets) selected sizes
Valve
- *a)* Grinders (hand)
- *b)* Spring lifters

Wrenches
- *a)* 8 in., 10 in., 12 in., and 18 in.
- *b)* Ignition sets
- *c)* Pipe, 10 in., 14 in., 16 in., and 18 in.
- *d)* Rim socket
- *e)* Socket sets, large assortment with case
- *f)* Spark plug
- *g)* Speed wrenches
- *h)* Standard end sets, ¼ in. to ⅞ in., U.S.S. and S.A.E.
- *i)* Valve-tappet wrenches

Automotive Shop—Materials and Supplies

Acetylene Gas — in drums, for welding
Acid
Alcohol
Babbitt
Bearing Blue
Bearing Compound
Bolts
- *a)* Machine, selected sizes
- *b)* S.A.E., selected sizes
- *c)* Stove, flat or round heads, selected sizes

Brake Juice — ½-pt. cans
Brushes
- *a)* Paint
- *b)* Spark-plug
- *c)* Spoke
- *d)* Steel
- *e)* Varnish

Chamois
Coil-Spring Assortment
Copper Tubing
Cotter Pins — assorted sizes
Crocus Cloth
Distilled Water
Drain Cocks
Electrolyte
Emery Cloth — Nos. 00, 0, ½, and 1
Enamel — Auto Painting
Gaskets
- *a)* Copper asbestos
- *b)* Cork and felt
- *c)* Flange

Gasoline
Grease — cup, cans
Kerosene
Keys, Whitney — assorted
Lacquer — colors
Lead
Lubricant — transmission
Nails and Brads
Nuts
- *a)* S.A.E., castellated, square, hexagon, selected sizes and kinds
- *b)* U.S.S., square and hexagon, selected sizes
- *c)* Machine-screw, selected sizes
- *d)* Wing, selected sizes

Oil
- *a)* Cylinder, light, medium, and heavy
- *b)* 600W
- *c)* Penetrating

Oxygen — in drums for lead burning
Pig Lead
Piston-Ring Compressors
Radiator Hose
Rivets — brake-lining, 5/16 in., ½ in., and ¾ in. long
Sandpaper — Nos. 00, 0, ½ and 1
Screws
- *a)* Flat-head or round-head, iron or brass, selected sizes and kinds
- *b)* Cap and machine, iron or brass, selected sizes and kinds

Sealing Compound
Shellac — ½-pt. cans
Shim Stock
Soapstone
Solder — bar, wire, or self-fluxing wire
Soldering Paste
Spelter — for brazing
Sponges — ½-lb.
Starting Cable
Tacks and Staples — upholstery
Tire
- *a)* Carcass fabric
- *b)* Cushion stock
- *c)* Inner-tube repair stock
- *d)* Patching cement
- *e)* Patches
- *f)* Putty
- *g)* Tread stock
- *h)* Vulcanizing

Valve-Grinding Compound — coarse and fine
Washers
- *a)* Lock, assorted sizes
- *b)* Wrought-iron

Waste
Wire — primary and secondary

ARC WELDING

—industry's most promising tool! TEACH IT! These four Lincoln books—used in hundreds of schools—will help you.

1. "PROCEDURE HANDBOOK OF ARC WELDING, DESIGN AND PRACTICE"

The biggest volume of up-to-date, authentic information on all phases of arc welding design and practice. Complete in every detail. 1012 pages. Recognized throughout the world as the authentic reference guide on all phases of arc welding. Written in clear, concise style. Profusely illustrated. 1243 photos and drawings. Printed on fine paper, bound in semi-flexible simulated leather, gold embossed, size 6 x 9 inches.

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109 outstanding welding studies from the $200,000 Award Program of The James F. Lincoln Arc Welding Foundation. Made available in book form by Trustees of The Lincoln Foundation, who regard the award papers a large and valuable source of scientific study, research and information on welding. Of convenient desk size, 6 x 9 inches; printed on fine paper, and bound in semi-flexible leather.

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is at your service in the teaching of Arc Welding and in meeting your requirements for arc welding equipment. Special inducements to schools. Consult the nearest Lincoln Office or write THE LINCOLN ELECTRIC CO., Dept. 11, Cleveland, Ohio.

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SUPERIOR DROP-FORGED TOOLS

DROP-FORGED WRENCHES

BRING INDUSTRY'S EXPERIENCE TO THE SCHOOL SHOP

● All industry depends on wrenches. Williams' Drop-Forged Wrenches have been an accepted standard for fifty years. Equip your school shop with the tools that industry uses and approves.

WILLIAMS' "SUPERRENCHES"

Drop-forged from chrome-molybdenum steel, scientifically heat-treated for maximum tough strength and chrome-plated. Their thin heads and pointed jaws get in and *grip* — they deliver the goods, without wasting time. Admittedly the finest wrenches of their kind, no school shop should be without them.

WILLIAMS' "SUPERSOCKET" WRENCHES

Famous for dependable, lightning-fast action. Heat-treated and chrome-plated, they feature thin socket walls for cramped quarters, plus extraordinary strength. Five complete lines, each with a full assortment of sockets, handles and parts. Sold individually and in handy Sets.

★ ★ ★ ★ ★

Write for Williams' Wrench booklet A-409 describing "Superrenches" and "Supersocket" Wrenches. Sold by industrial distributors everywhere.

J. H. WILLIAMS & CO., NEW YORK, N. Y.
225 Lafayette St.

Electrical-Shop Equipment, Supplies, and Motor and Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

Bench Grinder
Benches — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets
Bits
a) Auger, ¼ in. to 1 in. by 16ths
b) Auger, 11/16 in., 18 in. long
c) Drill, for wood, square shank, ⅛ in. to ½ in., by 16ths
d) Expansion
e) Extension, 18 in.
f) Screw-driver, ¼ in.
Blackboard — permanent or portable
Blowtorches — 1 qt. size
Bookcase
Braces — ratchet-type, 8 in. swing
Bulletin Board
Cabinets — wood or metal, for filing class records, instruction sheets, drawings, etc.
Chairs — teacher's and tablet-arm
Compass Saw
Coil
a) Spreader
b) Taper
c) Winder
Desk — teacher's, with drawer compartments
Drill
a) Breast
b) Concrete, ⅜ in., ½ in., ¾ in., 1 in.
c) Hand
d) Portable, electric
e) Twist, 1/32 in. to ⅜ in. by 32nds
Drill Press
a) Bench, hand or power driven
b) Heavy, power driven
Files
First-Aid Cabinet and Supplies
Hack Saw
a) Blades, 10 in., 24-tooth
b) Frames, adjustable
Hammers
a) Claw, 12-oz.
b) Machinists', ball-peen
Hickey — ½ in. and ¾ in.
Lathe
a) Engine, 10 in. or 12 in. swing, 6 ft. or 8 ft. long
b) Speed
Pliers
a) Gas, 6½ in. and 8 in.
b) Side-cutting, 6 in.
Punch — for metal molding
Punches — assorted
Reamers
a) Pipe burring, ¼ in. to 1 in.
b) Pipe burring, ½ in. to 2 in.
Rules
a) 48 in. zigzag
b) 72 in. zigzag
Screw Drivers — 3 in., 5 in., and 8 in.
Shears — for cutting metal molding
Solder Dippers
Soldering Coppers
a) Assorted
b) Electric
c) Handles
Stocks and Dies — for pipe threads, ½ in. to 1 in.
Vises
a) Machinists', 4 in.
b) Pipe
Wrenches
a) Adjustable, 6 in. and 8 in.
b) Pipe, 10 in., 12 in., and 14 in.
c) Socket, combination

Electrical Shop—Supplies

Abrasive Cloth — Aluminum oxide. 1, 1½, and 2 in. wide
Armored Cable
a) 2-wire, No. 14, single-strip
b) 3-wire, No. 14, single-strip
c) Box connectors
Attachment Plug
Bar Hangers
Batteries — dry cells
Battery Acid — 1.300
Battery Sealing Compound
Box Cleats
Brads — ¾ in., No. 19, and 1½ in., No. 16
Brake Lining — ¼ in. x 2 in.
Brushes — carbon, for motors and generators
Burglar Contacts
a) Open-circuit
b) Closed-circuit
Bushings
a) Loom, No. 1 and No. 2
b) "Jiffy" loom No. 2
Buzzers
Cleats — unglazed porcelain, 2-wire
Clips — test, with insulators, Universal, Nos. 22, 23, 24 and 25
Commutator Cement
Conduit
a) Bushings, ½ in., ¾ in., and 1 in.
b) Box connectors, for flexible
c) Couplings, for flexible
d) Lock nuts, ½ in., ¾ in., and 1 in.
e) Rigid, ½ in., ¾ in., and 1 in.
Condulet
a) Fillings, ½ in., LL, LR, and LB
b) Covers, ½ in., blank
Door Openers — mortised
Fish Paper — .0125 in. thick
Fixtures — brass-chain, suspension
Fixture Studs
Fuses
a) Plug-type, renewable, 125-volt, 15 amp.
b) Cartridge-type, renewable, 125-volt, 30 amp.
c) Renewals for plug fuses
d) Renewals for cartridge fuses
Ground Clamps — ⅜ in. to 1 in., assorted
Hickey Grips — ½ in. and ¾ in.
Lamps
a) Carbon, 220-volt, 60-watt
b) Mazda, selected as wattages and voltages
c) Guards for brass sockets
Leather Nail Heads
Lugs — 25- and 50-amp.
Lumber — 2 in. x 4 in. x 14 ft., No. 1, white pine dressed 4 sides
Molding
a) Metal
b) Metal, fittings — crosses, tees, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches
c) Wood, 2-wire, with capping
d) Wood, 3-wire, with capping
Nails — roofing
Nuts — iron, 4–36, 6–32, 8–32, 10–24, 12–24, 10–32, 14–20
Outlet Boxes — 4 in. square, with one round blank cover, and one cover with bushed opening
Pipe Straps — galvanized, ⅜ in., ½ in., ¾ in., and 1 in.
Push Buttons
a) Return-call, 3-point
b) Single
Receptacles
a) Flush, duplex
b) Porcelain-cleat, 660-watt, 250-volt
c) Concealed
d) Covers
Rectifiers — Tungar, for charging from 1 to 12, 6- and 12-volt batteries
Relays — Dixie
Resistance Boards — for testing
Resistance Units — 125-ohm
Rheostats
a) Compression, 275-watt
b) Field, for shunt and compound motors
Rosettes — wood
Rotary Converter — 5-kw. capacity, 3-phase a.c., 110-volt d.c.
Screws
a) Anchors, 8/32, 10/24, 12/24, 14/20
b) Machine, round-head, 4–36 x ¼ in., 6–32 x ½ in., 6–32 x ¾ in., 8–32 x ⅜ in., 8–32 x ½ in., 8–32 x 1 in., 10–32 x ⅜ in., 10–24 x ⅜ in., 10–24 x ¾ in., 10–32 x ¾ in., 12–24 x 1 in.
c) Machine, brass, round-head, 4–36 x ¼ in., 6–32 x ½ in., 6–32 x ¾ in., 8–32 x ½ in.
d) Wood, flat-head bright, No. 5 x ¾ in., No. 8 x ½ in., No. 8 x ¾ in., No. 8 x 1 in., No. 7 x 1½, No. 8 x 1½ in., No. 7 x 2
e) Wood, round-head blued, No. 7 x 1 in., No. 8 x 1½ in., No. 10 x 1½ in., No. 7 x 2
Sleeving — No. 1, white; No. 1, blue; and No. 1, red
Sockets
a) Brushed brass-pull-chain, keyless, key
b) Porcelain, keyless, with caps
c) Porcelain, key, with caps
Socket Caps — ¼ in. and ⅜ in. bushed
Solder Wire — 50/50, size No. 10
Soldering Paste — 2-oz. cans, noncorrosive
Soldering Salts — 1 oz. cans, noncorrosive
Speed Counters — 0–9999
Split Knobs — porcelain
Spring Balances — 0–30 lb.
Starting Boxes
a) For compound motors, various makes
b) For shunt-wound, 1 h.p., 110-volt motors. Overload release
c) For shunt-wound, 1 h.p., 110-volt motors. No voltage release
d) Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors
Storage Batteries — 6-volt

(Continued on page 52A)

General Electric Company

General Office: Schenectady, N. Y.

Sales Offices: Address Nearest Office

Akron, Ohio, 335 South Main St.
Atlanta, Ga., 187 Spring St., Northwest
Baltimore, Md., 39 West Lexington St.
Bangor, Me., 600 Main St.
Binghamton, N. Y., 19 Chenango St.
Birmingham, Ala., 600 North 18th St.
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Buffalo, N. Y., 1 West Genesee St.
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Charlotte, N. C., 200 South Tryon St.
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Cleveland, Ohio, 4966 Woodland Ave.
Columbus, Ohio, 40 South Third St.
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Davenport, Iowa, 511 Pershing Ave.
Dayton, Ohio, 25 North Main St.
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Detroit, Mich., 700 Antoinette St.
Duluth, Minn., 14 West Superior St.
El Paso, Texas, 109 North Oregon St.
Erie, Pa., 10 East Twelfth St.
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Fort Worth, Texas, 408 West Seventh St.
Grand Rapids, Mich., 148 Monroe Ave., Northwest
Hartford Conn., 410 Asylum St.
Houston, Texas, 1312 Live Oak St.
Indianapolis, Ind., 110 N. Illinois St.
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Jacksonville, Fla., 237 West Forsyth St.
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Knoxville, Tenn., 602 South Gay St.
Los Angeles, Calif., 212 North Vignes St.
Louisville, Ky., 455 South Fourth St.
Memphis, Tenn., 8 North Third St.
Milwaukee, Wis., 940 W. St. Paul Ave.
Minneapolis, Minn., 12 South Sixth St.
Nashville, Tenn., 234 Third Ave., North
Newark, N. J., 744 Broad St.
New Haven, Conn., 129 Church St.
New Orleans, La., 837 Gravier St.
New York, N. Y., 570 Lexington Ave.
Niagara Falls, N. Y., 253 Second St.
Oklahoma City, Okla., 119 N. Robinson Street
Omaha, Nebr., 409 S. 17th St.
Philadelphia, Pa., 1405 Locust St.
Phoenix, Ariz., 435 West Madison St.
Pittsburgh, Pa., 436 Seventh Ave.
Portland, Me., 25 Bedford St.
Portland, Ore., 920 Southwest Sixth Ave.
Providence, R. I., 111 Westminster St.
Reading, Pa., 31 North Sixth St.
Richmond, Va., 700 East Franklin St.
Roanoke, Va., 202 South Jefferson St.
Rochester, N. Y., 89 East Ave.
St. Louis, Mo., 112 North Fourth St.
Salt Lake City, Utah, 200 S. Main St.
San Antonio, Texas, 201 Villita St.
San Francisco, Calif., 235 Montgomery St
Schenectady, N. Y., 1 River Road
Seattle, Wash., 821 Second Ave.
Spokane, Wash., 421 Riverside Ave.
Springfield, Ill., 607 East Adams St.
Springfield, Mass., 95 State St.
Syracuse, N. Y., 113 South Salina St.
Tacoma, Wash., 1019 Pacific Ave.
Toledo, Ohio, 420 Madison Ave.
Tulsa, Okla., 409 South Boston St.
Utica, N. Y., 258 Genesee St.
Washington, D. C., 806 15th St., N.W.
Waterbury, Conn., 72 West Liberty St.
Wichita, Kan., 200 East First St.
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INTERNATIONAL GENERAL ELECTRIC CO., INC.

New York, N. Y., 570 Lexington Ave. Schenectady, N. Y.

G-E Educational Service

General Electric engineers will be glad to recommend apparatus to meet your special conditions if you will give them details such as: Type of course, number of students, laboratory or shop space available, money at hand for equipment, etc. Further than this, liberal discounts from the regular commercial prices of Company products are allowed to educational institutions. For quotations on apparatus and further information concerning G-E educational service, consult the Educational Specialist at the nearest office of the Company.

The General Electric Company is deeply interested in education, as it recognizes that the future welfare of industry, and of the country as a whole, depends upon how well the students of today are trained for the work of tomorrow. It is the policy of the Company to aid the faculty and students of our schools and colleges in every way possible. To this end, Company publications, motion-picture films, illustrated lectures, etc., are made generally available without charge.

New Shop Projects

The General Electric Company, in carrying out its educational program, has sponsored the preparation and publication of several construction projects for technical and vocational schools. These projects are exceptionally valuable for the school shop due to the fact that they are not merely assembly projects but involve a certain amount of mechanical dexterity with such tools as the lathe, drill press, tap and die. etc. The projects will comprise the following standard ratings:

Educational Projects. ¼ H.P. and ¾ H.P. Motors.

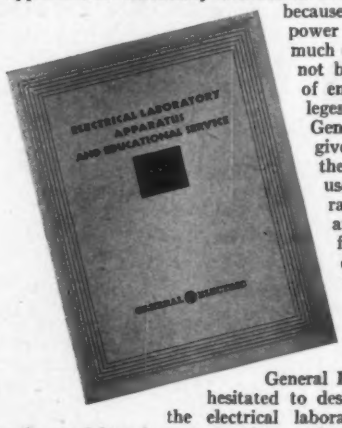
1) ¼ H.P. Single-Phase, 60 cycle, 110 volt capacitor motor
2) ½ H.P. Single-Phase, 60 cycle, 110/220 volt capacitor motor
3) ¾ H.P. 3-Phase, 60 cycle, 110 volt motor
4) 250 watt compound-wound D-C generator
5) 1½ kw. 220-110/55 volt, single-phase, air-cooled transformer

Kits for these projects can be purchased from the General Electric Company. In addition, complete instructions are given for the securing of any equipment that may not be included in the kit.

Illustrated Lecture Service

General Electric Motion Pictures are available without charge to educational institutions. They are particularly valuable to schools and colleges, as they enable the student and teacher to keep informed on all important developments in the electrical field. Complete information is available in publication GES-402F.

In general the General Electric Company recommends standard apparatus for laboratory instruction. It is recognized, however, that because of its size, cost, and the power required for operation, much commercial apparatus cannot be used in the laboratories of engineering schools and colleges. For this reason, the General Electric Company has given especial attention to the selection for educational use of such standard apparatus as is of suitable size and which will illustrate fundamental principles of design and construction as well as acceptable commercial practice.



Where standard apparatus is not suitable, the General Electric Company has not hesitated to design special apparatus for the electrical laboratory and shop. Among such special equipment may be mentioned the switchboards both for engineering and physics laboratories, special industrial control panels for A-C. and D-C. service, the AHI synchronous motor (or generator), and the 5 kw. rotary converter.

Thus the student is given an opportunity, while becoming familiar with the underlying principles of electrical engineering, to become acquainted with actual construction details. Bulletin GEA-1185C which has been recently revised, illustrates and describes G-E apparatus particularly adapted for laboratory use.

Electrical Laboratory and Shop Equipment

When deciding on the equipment for an electrical shop or laboratory, Bulletin GEB-62B will be particularly useful. In this booklet will be found listed in three different groups, equipment to meet a wide range of requirements. For the elementary courses a few of the more important types of machines are recommended, together with control apparatus, measuring instruments, and certain machine tools which should be in every electrical shop. For more advanced work, or as funds become available, equipment from other groups may be added to provide well balanced laboratory equipment which will permit a wide range of experiments.

In addition to listing the equipment, this booklet discusses briefly the several items, explaining why they have been selected and the use to which they may be put in the laboratory.

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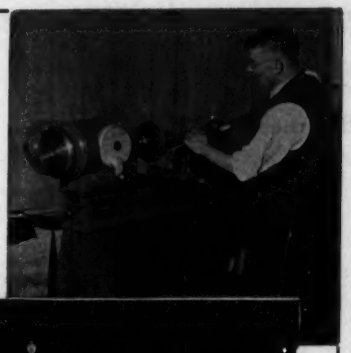

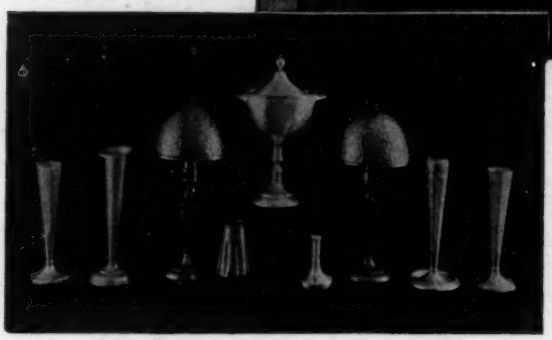

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Our new catalog is ready. If interested write for a copy, mentioning this magazine.

Metal Crafts Supply Co.
10 Thomas Street **Providence, R. I.**

(Continued from page 50A)

Switch
- *a*) Battery, 4-point
- *b*) Bases, porcelain, for 10-amp. switches
- *c*) Boxes, 2¾ in. deep
- *d*) Entrance, safety, 2-pole, 30-amp., with 2-branch lighting circuits
- *e*) Entrance, safety, 3-pole, 30-amp., 250-volt
- *f*) Flush, push-button, S.P., D.P., 3-way, 4-way
- *g*) Surface, S1, S3, and S4
- *h*) Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
- *j*) Surface, snap, electrolier
- *k*) Surface, snap, S.P.D.P., 3-way, 4-way

Switchboard — as required

Tacks — double-pointed No. 10

Tape
- *a*) Friction, ½-lb. rolls
- *b*) Rubber, ½-lb. rolls

Telegraph Sets — including sounders, keys, and relays

Telephones
- *a*) Complete bridging, independent phones
- *b*) Couch vestibule telephones
- *c*) Receivers, transmitters, induction coils, condensers, and bridging switch hooks

Transformers
- *a*) Bell-ringing, 6-, 8-, 14-volt
- *b*) Single-phase, 110–220-volt, S.K.V.A.

Tubes — porcelain, 5/16 in. x 3 in., 5/16 in. x 5 in., and 5/16 in. x 10 in.

Tubing — flexible nonmetallic, ¼ in. and ⅜ in.

Washers
- *a*) Iron, ¼ in. and ⅜ in.
- *b*) Brass, ¼ in. and ⅜ in.

Wire
- *a*) Annunciator No. 18 or No. 20
- *b*) Fixture, No. 18, single yellow, with marker
- *c*) Rubber covered, solid copper, No. 10, black
- *d*) No. 10, white
- *e*) No. 14, black
- *f*) No. 14, white
- *g*) Rubber covered, No. 16, brewery cord
- *h*) No. 18, lamp cord, green and yellow
- *j*) S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop—Motor and Testing Equipment

Annunciators
- *a*) Automatic needle-drop
- *b*) Gravity-drop
- *c*) Manual needle-drop

Armatures — burnt-out, for repairing

Battery Charger — commercial

Circuit Breakers
- *a*) Air, single-pole, overload, 25-amp., 550-volt
- *b*) Air, single-pole, underload, 15-amp., 550-volt

Controllers
- *a*) For multiple-speed motor
- *b*) For 1-h.p., 110-volt series motors

Generators
- *a*) Motor-generator set, 10-h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
- *b*) Generator, 6-volt d.c., coupled to an a.c. motor for 6-volt circuit testing
- *c*) Auto generators of different makes

Gravity Cells

Magnets — testing, 10,000-ohm

Meters
- *a*) Ammeter, standard, 60-amp., a.c.
- *b*) Ammeter, standard, 60 amp., d.c.
- *c*) Ammeter, student, 60-amp., a.c.
- *d*) Ammeter, student, 60-amp., d.c.
- *e*) Voltmeter, standard, 0–10-volt, d.c.
- *f*) Voltmeter, standard, 110–220-volt, d.c.-a.c.
- *g*) Voltmeter, standard, 125-volt, a.c.
- *h*) Voltmeter, standard, 125-volt, d.c.
- *j*) Voltmeter, student, 110-volt, d.c.
- *k*) Voltmeter, student, 110-volt, a.c.
- *l*) Wattmeter, standard, 110–220-volt, 30–60-amp., d.c.-a.c.
- *m*) Wattmeter, student, 110–220-volt, 30-amp., a.c.-d.c.
- *n*) Watt-hour meter, 125-volt, 5 amp., a.c., single-phase, various makes

Motors
- *a*) Auto starter, different makes
- *b*) Burnt-out, fractional h.p., 110-volt, 60 cycle, for repairing
- *c*) Compound, 1-h.p., 110-volt, d.c.
- *d*) Multiple-speed, 1-h.p., 3-phase, 220-volt
- *e*) Series, 1-h.p., 110-volt, d.c.
- *f*) Shunt, 1-h.p., 110-volt, d.c.
- *g*) Split-phase and repulsive, a.c., 110-volt. single-phase, assorted
- *h*) Split-phase induction motors, fractional h.p., 110-volt, 60-cycle, different makes
- *j*) 3-phase, 1 h.p., a.c., 220-volt, various makes
- *k*) 3-phase, 2 h.p., 220-volt, a.c., various makes
- *l*) Universal, fractional h.p., 110-volt, different makes
- *m*) Universal, variable-speed, ½ h.p.

Platform Scale — 100-lb. capacity

STANDARD

for INSTRUCTION, RESEARCH, INDUSTRY

The use of WESTON instruments in educational work and scientific laboratories has become a fixed principle, for nothing short of WESTON accuracy and dependability are acceptable for engineering training. WESTON instruments are made to most exacting standards of craftsmanship and accuracy. They inspire students to be exact in experiments. And in using WESTONS in training, the student is familiarizing himself with the instruments he will use throughout his engineering career, for student graduates since 1888 have "Westonized" the industrial world.

Following is a condensed listing of the WESTON instruments available; also are illustrated a few of the models widely used in educational work. Complete information on all models is available in booklet form, and will gladly be sent on request. Weston Electrical Instrument Corporation, 595 Frelinghuysen Avenue, Newark, New Jersey.

MODEL 633
A.C. Clamp Ammeter
Current readings obtained simply by placing clamping jaws around conductor. Circuits never disturbed. 6 current ranges. High insulation for complete protection.

MODEL 607
***Photronic Photoelectric Relay**
Ideal to demonstrate theory and operation of photoelectric cells and sensitive relays. Consists of a WESTON Photronic Cell, a WESTON Sensitive Relay and a Power Relay mounted on a common base and wired. No outside voltage, nor troublesome amplifier required.

MODEL 280
Miniature Precision D.C. Instruments
Convenient and practical for student use, combining miniature size and ruggedness. Size 4⅜ x 4⅜ x 1¾ inches. Accuracy 1% . . . hand calibrated mirror scales and knife-edged pointers. Available in single and multi-range instruments.

PORTABLE INDICATING INSTRUMENTS
Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

PANEL MOUNTING INSTRUMENTS
Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

INSTRUMENT TRANSFORMERS
Portable and Switchboard – Potential and Current

RELAYS
Sensitive and Power Uses – Current and Voltage Types

AIRCRAFT INSTRUMENTS
Tachometers, Temperature Indicators, Radio Compass Indicators, Ammeters, Voltmeters, etc.

ELECTRIC TACHOMETERS
A.C. and D.C. Types – Remote Indicating

LABORATORY STANDARDS
Voltmeters, Ammeters, Wattmeters

SPECIALIZED TESTING EQUIPMENT
Power Analyzer, Photoelectric Potentiometer, Battery Testing Instruments

SERVICE EQUIPMENT
Tubecheckers, Analyzers, Oscillators, Ohmmeters, Vacuum Tube Voltmeters

PHOTOELECTRIC CELLS
"Photronic" Cells – Dry Disc Type

PHOTOELECTRIC CONTROL DEVICES
"*Photronic" Cell Controls, Illumination Controls, Smoke Alarms, Industrial Controls

LIGHT MEASURING DEVICES
Illumination Meter, Foot Candle Meters, Sight Meter, Exposure Meters

TEMPERATURE INDICATING INSTRUMENTS
ELECTRICAL TYPE – Remote Indicating
BIMETALLIC DIAL TYPE – Laboratory, Industrial

INSTRUMENT ACCESSORIES AND PARTS
Shunts, Cables, Resistors, Switches, Binding Posts, Leads, Multipliers, Adapters, Radio Plugs, etc.

STANDARD CELLS

***Photronic – A registered trademark designating the photoelectric cells and photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corporation.**

MODEL 785
Industrial Circuit Tester
Provides 27 ranges . . . all the ranges necessary for voltage, current and resistance measurements in signal, control and electronic circuits, or wherever else high sensitivity is a factor.

MODEL 430
Portable, Precision A.C. and D.C. Instruments
Universally used in schools and industry wherever rugged, portable instruments are required for general testing. Hand calibrated, mirror scales with knife-edged pointers.

MODEL 375
Student Galvanometer
Widely used in school laboratories where durability and low cost are requirements, rather than extreme sensitivity. Other models of medium and high sensitivity available.

WESTON *Instruments*

Printshop Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Bellows
- *a)* Hand, small size
- *b)* Electric, blower type

Blackboard — permanent or portable

Bookcase — for reference books, catalogs, etc., sectional preferable

Brayer — 6 in. or 8 in., for proofing

Brushes
- *a)* Bench
- *b)* Benzine, No. 1, oval black
- *c)* Floor
- *d)* Padding, 1½ in. wide

Bulletin Board

Cabinets
- *a)* Galley, for double-column, wood or steel, four tiers (to be used with typesetting machines)
- *b)* Galley, for 8¾ in. by 13 in. galleys, wood or steel, four tiers
- *c)* Ink and roller, to accommodate platen-press rollers, wood or steel
- *d)* Matrix, for use with typesetting machines only
- *e)* Roller, cabinet or rack for cylinder rollers
- *f)* Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
- *g)* Type, school-type, each to accommodate two California cases, job cases, case slides, galley slide, and copy holder
- *h)* Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
- *j)* Type, complete with 24 full-size California job cases, double work bank, wood or steel
- *k)* Wood or metal, for filing class records, instruction sheets, etc.

Cans
- *a)* Benzine, pint-size
- *b)* Benzine, 5-gal. size
- *c)* Kerosene, safety, 1-gal. size
- *d)* Waste can, fireproof, for rags

Cases
- *a)* Blank, full-size, to accommodate ¼-size cases
- *b)* Border, ¼-size, for ornamental borders
- *c)* Lead and slug, regular-size, to hold labor-saving fonts of leads and slugs
- *d)* Metal furniture, to hold labor-saving fonts
- *e)* Rule, ¼-size, for brass rule

Chairs — teacher's and tablet-arm

Chase Racks
- *a)* For platen presses
- *b)* For cylinder presses

Chases
- *a)* For each size of platen press
- *b)* For cylinder press

Composing Sticks — 6 in. x 2 in., 8 in. x 2 in., 12 in. x 2 in., and 18 x 2 in., adjustable

Cutter
- *a)* Lead and rule
- *b)* Paper, lever-type, 20 in., with pedestal. Should handle 20 in. x 26 in. sheet
- *c)* Paper, lever-type, 26 in. or 30 in.
- *d)* Paper, lever-type, 30 in., with divided back gauge
- *e)* 30 in. to 36 in. power cutter

Desk — teacher's, with drawer compartments

Drying Racks
- *a)* Combination drying rack and stock table for platen presses, 30 trays
- *b)* Trays, interlocking, for cylinder press

Folding Bones — for hand folding

Folding Machine — 20 in. x 26 in. size, 4-fold, two parallel and two right-angle folds, power

Furniture — iron, 2 x 4 to 10 x 15 picas

Galleys — Steel, 8¾ in. x 13 in., 6¼ in. x 23½ in., double column, and 12 in. x 18 in.

Gauge Pins — spring-tongue

Glue Pot — electric, 1-qt. size

Imposing Tables
- *a)* 12 in. x 18 in., with iron top, including reglets and furniture
- *b)* 24 in. x 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *c)* 36 in. x 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *d)* 39 in. x 63 in., with iron top, complete drawers, letter boards, reglets, and furniture

Ink Fountains
- *a)* Short, for 8 x 12, 10 x 15, and 12 x 18 presses
- *b)* Long, for 10 x 15, and 12 x 18 presses

Knives
- *a)* Overlay, for make-ready
- *b)* Ink, 6 in. and 8 in.
- *c)* Ink, 8 in., square end

Leader Boxes

Leaders
- *a)* 6-pt., 8-pt., and 10-pt., fine dot
- *b)* 8-pt. and 10-pt. hyphen

Line Gauges
- *a)* Metal, brass, or steel
- *b)* Wood

Metal Furnace — for recasting and refining type metal, used only with typesetting machines

Mitering Machine

Numbering Machines
- *a)* For use on presses
- *b)* Hand machines

Ornaments
- *a)* Assorted floral and decorative designs
- *b)* Border, 6-pt. and 12-pt., decorative

Perforator
- *a)* 24 in., foot treadle
- *b)* 28 in., foot treadle

Planer
- *a)* Mallets, hickory or fiber
- *b)* Proof, maple, with felt bottom
- *c)* Type, maple, with leather top

Presses
- *a)* Cylinder, two-revolution, four-roller, 25 x 38, complete with variable-speed motor, cast rollers, etc.
- *b)* Platen, 8 x 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
- *c)* Platen, 10 x 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
- *d)* Platen, 12 x 18, complete with variable-speed motors, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
- *e)* Proof, 14 x 18, with cabinet
- *f)* Proof, 20 x 24, with cabinet

Punch
- *a)* Foot-power. multiple, with assorted punches
- *b)* Lever, two-die, with assorted punches
- *c)* Power, multiple, with assorted punches (paper drill may be substituted)

Quoins
- *a)* Sizes No. 1 and No. 2
- *b)* Keys, Sizes No. 1 and No. 2

Rule — plain and brass (fonts to fit quarter cases)
- *a)* 2-pt., labor-saving, hair-line, side face
- *b)* 2-pt., labor-saving, 1-pt. side face
- *c)* 1-pt., labor-saving, 1-pt. face
- *d)* 2-pt., labor-saving, double face

Saw Trimmers — pedestal type, with point gauge, and raising and lowering table

Spacing Material
- *a)* Iron furniture, as selected
- *b)* Leads, labor-saving, 2-pt.
- *c)* Leads, 2-ft. strips, 2-pt.
- *d)* Slugs, labor-saving, 6-pt.
- *e)* Slugs, 2-ft. strips, 6-pt.
- *f)* Spaces and quads
- *g)* Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

Specimen Display Board

Staple Binder — pedestal-type, foot power

Stitcher — wire, power, capacity ½ in. or ¾ in., flat and saddle-back tables

Tweezers — 3½ in.

Tympan Paper (with combination holder and cutter)
- *a)* 18 in.
- *b)* 38 in., upright, to be used with cylinder press only

Type
- *a)* Body, lightface — 8 and 10 pt.
- *b)* Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
- *c)* Job, lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
- *d)* Job, boldface — 6 and 8 pt.; 12 pt.; No. 26; 12-pt. No. 27; 12-pt., No. 28; 18-pt., No. 30
- *e)* Job, light copperplate Gothic — 6 pt. Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
- *f)* Job, condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
- *g)* Job, text type — 10, 12, 14, 18, and 24 pt.
- *h)* Job, typewriter type — 12 pt. with spaces
- *j)* Job, boldface italic — 8, 10, 12, 14, 18, 24, 30 and 36 pt.
- *k)* Job, heavy copperplate Gothic — 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
- *l)* Wood, condensed Gothic — 8, 12, 15 and 18 line

Typesetting Machines
- *a)* Either linotype or intertype, 2 or 3 magazines, and molds
- *b)* Matrices for same, 6-, 8-, 10-, and 12-point, as selected

Supplies

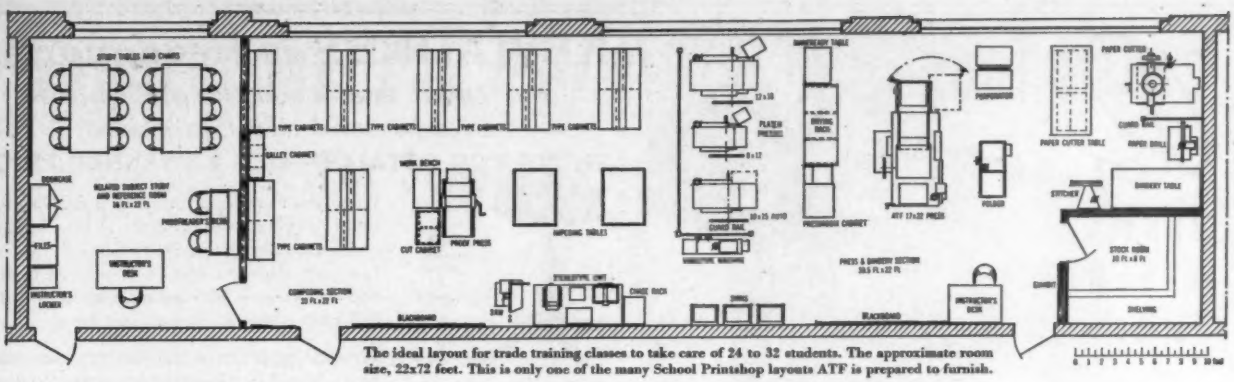
Bensine or Gasoline — for cleaning type or presses

Bindery Tape — 2 in. wide, brown or black

Gold Bronze — pale

Ink
- *a)* Bond, black, for bond papers
- *b)* Book, black, for school paper, etc.
- *c)* Cover, colors as selected
- *d)* Dryers and compounds, as selected
- *e)* Halftone, black
- *f)* Job, colors as selected

(Continued on page 56A)



The ideal layout for trade training classes to take care of 24 to 32 students. The approximate room size, 22x72 feet. This is only one of the many School Printshop layouts ATF is prepared to furnish.

ATF School Printing Units

No. 099 Vandercook Proof Press

Accurate, rigid and accessible. Ideal for all hand inking work on 12½x16 inch printing surface.

American Type Founders maintains an experienced staff of engineers who will be glad to furnish, without cost, a layout for the school printing unit that best suits your needs. Their services are also available in the planning of your department, or in solving any difficulties in the layout and organization of your printshop, and in the selection of equipment you you will use. Don't hesitate to avail yourself of this service. There is absolutely no cost or obligation. Just write on your letterhead to

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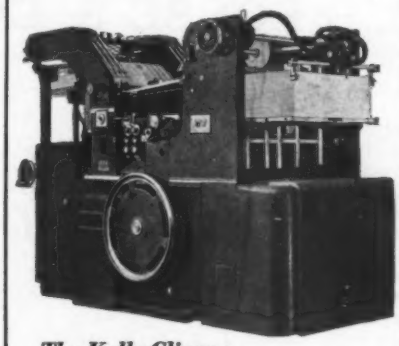
BRANCHES AND DEALERS IN TWENTY-THREE PRINCIPAL CITIES

- *These are only a few pieces*
- *in the large assortment*
- *of ATF school printshop*
- *equipment. Send for list.*

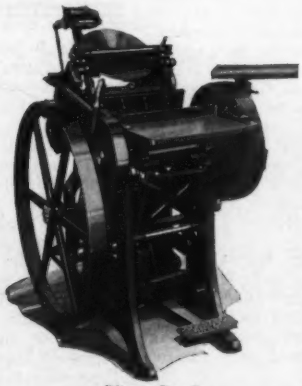


The Kelly Clipper

New efficient, automatic cylinder press that takes a 13½x20 inch maximum sheet…latest addition to the distinguished Kelly line. Ideal in size for the up-to-date trade training class.

Boston Wire Stitcher

Handles work up to ½ inch in thickness. Easily arranged for saddle or flat stitching. A safe, efficient machine for the average shop. Also power stitchers in all sizes for the larger units.

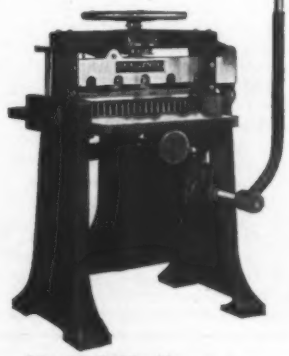


New Series C & P Platen Press

3 sizes—8x12, 10x15, 12x18. Equipped with latest, improved safety devices. Adequate for all purposes in junior and senior high school printing units.

Double-tier Wall Type Cabinet

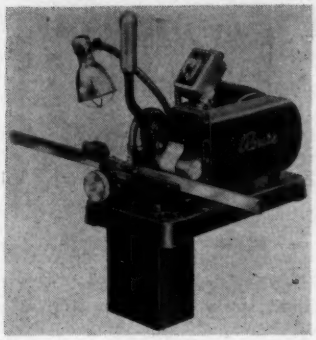
Provides easy access to all compartments of type cases. Large working surface that takes full size working galleys. Lifetime, all steel construction, olive green finish.



No. 265 Challenge Lever Paper Cutter

Safe, easy to operate, and thoroughly dependable. The same efficient equipment used in many commercial plants all over the country. Heavy construction insures lifelong service.

Rouse
VERTICAL MITERER For Schools



The Rouse Power Mitering machine is standard equipment in progressive printing plants. It makes 1000 miters an hour. A knowledge of its operation is essential to the sincere printing student.

The Rouse Vertical Miterer for Schools has extra guards, affording complete protection to the operator. It is as safe as a hand mitering machine. It should be in every school printing department.

For 40 years H. B. Rouse & Company has manufactured Rouse Composing Sticks, Rouse Lead & Rule Cutters, and Rouse Miterers. Complete information on any Rouse equipment will be sent upon request.

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Drawing and Art Equipment
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Metal Worker's Table No. N-3151

Manual Training Bench No. N-3088

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Representatives in Principal Cities

(Continued from page 54A)

g) Metallic, gold and silver
h) Process, black, red, yellow, blue

Kerosene — for cleaning rollers

Padding Cement
a) Cold
b) Hot

Paper
a) Bond, fine grade, 17 x 22 — 20, white
b) Bond, medium grade, 17 x 22 — 20, white
c) Bond, sulphite, 17 x 22 — 20, white
d) Bond, sulphite, 17 x 22 — 20, colors as selected
e) Book, enamel, 25 x 38 — 80, white
f) Book, machine finish, 25 x 38 — 80, white
g) Book, eggshell finish, 25 x 38 — 60, white
h) Cover, as selected, 20 x 26, medium
j) Card Bristol, fine grade, 22 x 28 — 4-ply, white
k) Index Bristol, medium grade, 25½ x 30½ — 110, white
l) Index Bristol, medium grade, 25½ x 30½ — 140, white
m) Mill Bristol, medium grade, 25½ x 30½ — 140, colors as selected
n) Pressboard, red
o) Strawboard, No. 40 or No. 50
p) Tagboard, manila, 24 x 36 — 140
q) Tympan, to fit presses
r) Wrapping paper, size as selected
s) Holder for same

Paste
a) Bindery
b) Make-ready

Twine — cotton, for tying jobs

Wire Stitching
a) No. 25 round wire for stitcher
b) Wire staples, ¼ in.

(Continued from page 43A)

♦ Mr. L. H. Harnsberger has recently retired after many years of service as teacher of woodworking in the St. Paul, Minn., school system.

♦ A. W. Blake is acting as the director of industrial education for Fort Smith public schools. He replaces R. B. McHenry who resigned on leave of absence to take over his new duties with the NYA with headquarters in Washington, D. C.

♦ The following changes of positions were recently made in the Chicago school system:

Mr. Leo Herdieg was made district superintendent. Mr. Norman Anderson was appointed head of the vocational centers. Mr. L. D. Perry was made principal of the Amundsen High School. Mr. Glenn Worst was made principal of the Calumet High School, Mr. Harry McKinsie was made district superintendent. Mr. James Gaffney, former principal of Roosevelt High School, was made assistant superintendent in charge of evening and summer school.

News Notes

♦ Reprints of the 92-page bulletin known as the *Standards of Attainment in Industrial-Arts Teaching*, published by the industrial-arts section of the American Vocational Association, are again available at 25 cents per copy, or 20 cents per copy in lots of 10 or more. Orders should be sent to Mr. L. H. Dennis, Executive Secretary, American Vocational Ass'n., Denrike Bldg., 1010 Vermont Ave., Washington, D. C.

At the last A.V.A. convention at Grand Rapids, it was decided that this bulletin be revised. This will take about two years. The members of the revision committee are: Charles F. Bauder, William T. Bawden, Clyde A. Bowman, Emanuel R. Ericson, John F. Friese, Verne C. Fryklund, Arthur B. Mays, Maris M. Proffitt, William E. Roberts, Robert W. Selvidge, Homer J. Smith, and George F. Weber.

♦ Independent School District No. 1, Cassia County, Burley, Ida., has just completed and begun using a new industrial-arts building at a cost of $16,000. The new building is located at the rear of the junior-senior high-school building and enlarges the high-school plant to a student capacity of approximately 1,100.

The industrial-arts building provides two shop rooms and one classroom for agriculture. It provides facilities for an expanded industrial-arts program reaching 250 boys in shop classes and 125 boys in agriculture. The program is particularly attractive to junior-high-school boys.

Association News

♦ The January meeting of the School Crafts Club of New York City, held at the Hotel Imperial, was attended by a large gathering. The speaker of the evening was Mr. Albert Verber, whose subject was jewelry making and methods of motivating the work by actually "Earning While Learning." At the next meeting, to be held on February 24, Mr. J. I. Biegeleisen will present "Silk Screen Stencil Printing as a Craft and as a Hobby." — *Harvey E. Parry.*

♦ One of the most practical meetings in the history of the Rochester Club of Printing House Craftsmen was held at the department of publishing and printing of the Rochester Athenaeum and Mechanics Institute on January 15. The main speaker of the evening was John A. Backus, Director, Department of Education, American Type Founders Sales Corporation. Mr. Backus showed slides and gave an enlightening historical sketch of printing from the earlier days. On the "Board of experts" were Mark Ellingson, president of RAMI; Charles L. Newman, Madison High School; and Charles L. McIntosh, Edison

(Continued on page 65A)

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No. 1 VANDERCOOK PROOF PRESS

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Current information covering all envelopes — commercial, coin, catalog, bankers flap, clasp, collection, baronial, window and many other styles are illustrated with examples to show how costs are computed.

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Drafting Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Adjustable-Curve Ruler
Beam Compass
Bench Brushes
Blackboard
- *a*) Permanent or portable
- *b*) Compass, 15 in., with locking device
- *c*) Drawing set: T square, straightedge, triangle, and protractor

Blueprint
- *a*) Frame or machine
- *b*) Washing trays or washer
- *c*) Paper tube, air-tight
- *d*) Drying rack or dryer

Bookcase
Cabinet
- *a*) For filing drawings
- *b*) For storing drawing boards
- *c*) For storing drawing instruments
- *d*) For storing models

Calipers — 6 in. and 8 in., inside and outside
Chair — teacher's
Desk — teacher's
Dividers — proportional
Drafting machine — and accessories
Draftsman's Steel Protractor
Drawing Boards — large
Drawing-Board Supports — to be set on or attached to woodworker's bench
Drawing Tables and Stools
- *a*) For Students
- *b*) For Teachers

Ink-Bottle Holder
Irregular Curves — Nos. 17, 21 and 24, wood, rubber, or transparent
Lettering Angles
Lettering Pens — assortment of 12
Level or Transit — builders' for architectural students
Leveling Rod — for use with the transit
Machinists' Combination Set — 12 in.
Marking Pins — for use with measuring tape, for architectural students
Micrometer — 1 in., for mechanical-drafting students
Oilstone — 3 in. case
Pantograph — 21 in.
Parallel Rules
Planimeters
Plumb Bob
Shears — for trimming blueprints and drawings
Speed Counter — for mechanical-drafting students
Steel Scales — 12 in.
Stop Watch — for mechanical-drafting students
Table
- *a*) For cutting and trimming drawings and blueprints
- *b*) For disassembling and reassembling machine parts and models

Tapeline
- *a*) 100 ft. steel, for architectural students
- *b*) 50 ft., steel or metallic

Tool Box — containing 1 machinists' hammer, one 6 in. adjustable wrench, one 6 in. screw driver, one 6 in. combination pliers
Triangles
- *a*) 30-60-deg. 14 in. transparent
- *b*) 45-deg. 10 in. transparent

Triangular Scales — civil engineers' type, 12 in.
T Square — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing boards
Wall Charts — lettering, decimal equivalents, etc.
Yardstick

Drafting—Small Equipment

To be provided by, or for, each student

Drawing Board — size to be specified by instructor
Drawing Instruments — as specified by instructor
Erasing Shield
Irregular Curve — Nos. 8 and 13, transparent
Pencil Compass
Penholder — for lettering pens
Pens — assorted, for lettering
Protractor — not over 5 in.
Scale — 12 in. architects', triangular
Scale Guard
Slide Rule — 10 in., as specified by instructor
T Square — to fit drawing board
Triangles — 30-60-deg., 10 in. transparent, and 45-deg., 8 in. transparent

Drafting Supplies

Bichromate of Potash — crystals
Blueprint
- *a*) Paper, 36 in. wide
- *b*) Writing fluid

Paper
- *a*) Cross-section, 8½ in. x 11 in.
- *b*) Detail, 24 in. x 36 in.
- *c*) Drawing, 24 in. x 36 in.
- *d*) Isometric, 7 in. x 10 in.
- *e*) Tracing, 36 in.

Powder — for tracing cloth
Tracing cloth — 36 in.
Van Dyke
- *a*) Fixing salts
- *b*) Paper, 36 in.
- *c*) Writing fluid

Drafting—Additional Supplies

To be provided by, or for, each student

Erasers
- *a*) Cleaning
- *b*) Ink
- *c*) Pencil

Ink
- *a*) Black, waterproof
- *b*) Colored, if required

Pencils — drawing, HB, 2H, 3H, 4H, and 6H
Pencil Pointer Pad
Thumbtacks

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(Continued from page 56A)

Technical High School. These men gave short talks on the three types of printing education: industrial arts, vocational, and professional.

Discussion leader R. Randolph Karch had difficulty in choosing questioners from the floor, as many attempted to get on their feet during the discussion period. A few of the questions for discussion resulted in the following statements from the leaders and agreement from the floor:

Apprentices should be selected from schools. There is little to gain by picking boys from the street, who are not sure that they like the industry, and who must be started from scratch in their apprenticeship.

School-trained apprentices are employed by industry in this area. Fully 60 per cent of the club members had boys from the schools working in their plants. All Institute boys were employed at from $20 to $35 per week.

Industrial-arts courses are not attempting to train boys for the trade, but to give them tryouts in one of the biggest industries in the country so that they can make intelligent choices later on in school life.

Compared with the professions of medicine and law, printing has only two institutions on the professional level. Professional men in other endeavors can write to 73 schools of medicine and 93 schools of law for advice and help — printers cannot do this. There is a definite need for more printing schools on the professional level.

Research in printing is practically nil, compared to other professions, and steps should be taken to correct this fault.

Major functions of professional schools should be: training in all aspects of the printing industries; research with and for industry; and library material of a high order.

Vocational-high-school boys get 600 hours of practical training per year to prepare them for advanced apprenticeship. Professional courses run from two to four years.

The old-time apprenticeship is fast waning — one member told of milking cows, cleaning spittoons, and raking leaves as part of his "course" as a shop apprentice.

Printing teachers have great difficulty with students who do not learn how to spell and divide words — the failure of our English departments in the schools. Instructors in all levels of printing education are forced to develop means for teaching these simple skills.

William C. Lennox, Stanley Mix, and Norman Clement were respectively installed as president, vice-president, and secretary. Elected to the Board of Governors were Lawrence Bishop, Joseph Collins, Frank Eichorn, R. Randolph Karch, Walter Moffitt, Harry Smith, James Eilinger, and Frank Fosmire.

♦ Nearly 150 members of the Massachusetts Industrial Education Society met Saturday, January 13, at the Hotel Lenox, Boston, for their annual get-together and dinner.

Dr. Ralph E. Pickett, assistant dean of New York University School of Education, guest speaker, discussed the dangers arising from unfounded statements; damage in the industrial-arts field coming from the extremists and not the conscientious workers. There has been too much acceptance of assertions and too little experimentation in our field. Dr. Pickett ended his fine talk with the statement, "if industrial arts has something to offer, tell people about it and we will not need to worry about the taxpayers curtailing our services in times of depression."

Invited guests at the dinner included: A. Russell Mack, state supervisor of secondary education; Robert O. Small, state division of vocational education; Charles M. Herlihy, president of Fitchburg State Teachers College; Jesse B. Davis, Dean of Boston University School of Education; Everett J. McIntosh, president of the Massachusetts Teachers Federation; and Michael J. Downey of the Boston School Department.

Gustave A. Larson of Malden, president of the society, presided. — *Otis W. Leary.*

♦ The Connecticut Industrial Arts Association will hold its Spring Convention on March 15 and 16 at Greenwich, Conn.

(Continued on page 67A)

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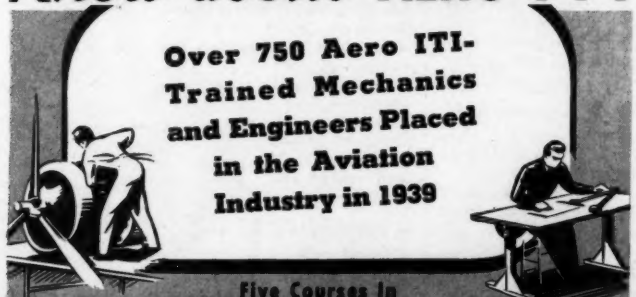

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(Continued from page 65)

The program is as follows:

Friday, March 15 — Registration, exhibits, and business meeting in afternoon.

6:30 p.m. — Banquet. Mr. John Shea, Toastmaster; President Eugene Giammatteo, chairman. Music and entertainment.

7:30 — Welcome by Dr. Welte; greetings, Commissioner Alonzo Grace (State of Connecticut); address by John J. Metz, Editor of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, entitled, "The Industrial-Arts Teacher"; address by Dr. William E. Warner, Professor Industrial Education, Ohio State University, Columbus, Ohio, entitled, "The Modern School Becomes a Laboratory of Living."

9:00 — Exhibits.

Saturday, March 16, 9:30 a.m. — Address by Dr. William E. Warner, "Curriculum Experimentation in Industrial-Arts Education." Discussion panel led by Dr. Lawrence F. Ashley, Chief, Division of Vocational Education, Department of Education, Yonkers, N. Y.

11:15 — Exhibits.

12:30 — Luncheon meeting. Address by Dr. Hugh Shields and Igor Sikorski.

3:00 — Ship awards: Mr. John Backus, and Mr. Lee Arduser.

♦ The Georgia Industrial Arts Association will hold its annual meeting along with the Georgia Education Association in Macon, Friday, March 15. It will be attended by approximately 100 teachers and administrators of industrial arts.

A bulletin entitled, "Industrial Arts Laboratory," written by the members of this association, was published by the State Department of Education during the past year. — *Harold J. Sacks*, president.

♦ The midwinter meeting of the Industrial Arts Teachers Association of Newark, N. J., was held on January 11, 1940.

A panel discussion was held on, "Some Trends in Industrial-Arts Education in Newark."

Arthur T. Giblin was chairman, and the panel members were, Henry M. Regan, George Peterson, Armand G. Rehn, and Jerome King.

The next meeting will be held on March 14, 1940. — *H. G. Stintsman.*

♦ The Michigan Industrial Education Society is busy with preparations for its Thirteenth Annual Convention to be held in Detroit, April 18, 19, 20.

The program will include among its general session speakers, Dr. Vierling Kersey, Superintendent of Schools, Los Angeles, Calif.; Dr. R. O. Small, President of the American Vocational Association, and Director of Vocational Education, Boston, Mass.; and Major Norman A. Imrie of the *Columbus Dispatch*. The theme of the Convention emphasizes problems of industrial education — "New Frontiers Within the Old."

The local convention committee is headed by Earl L. Bedell, Director of Vocational Education in Detroit.

♦ The next meeting of the Long Island Industrial Arts Teachers Association will be held at Great Neck, L. I.

Roy Fales, State Department of Education, Albany, N. Y., will speak on, "The Changing Secondary-School Program and Its Relation to Industrial Arts" at this meeting.

♦ At a recent meeting of the St. Louis Elementary Industrial Arts Club, the following men were elected as officers for the coming year: president, T. J. FRENCH; vice-president, J. ERNEST KUEHNER; and secretary-treasurer, MILTON GRUBER.

♦ The American Council of Guidance and Personnel Associations will meet at St. Louis, Mo., February 21 to 24, 1940. For further information, write A. J. Brumbaugh, Dean of the College, University of Chicago, Chicago, Ill.

♦ The nineteenth annual conference on printing education will most likely be held on June 30, July 1, 2, and 3, at the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y.

The program is being planned to solve many individual teachers' problems of instruction, promotion, and the advantages and disadvantages of printing production in the school shop. The department of publishing and printing of the Institute, one of the best equipped in the country, will demonstrate the latest equipment to visitors. A celebration of the 500th anniversary of movable type will be the theme at the annual banquet.

Should the foregoing dates be changed for any reason, ample advance notice will be given in these columns.

♦ The annual Illinois Vocational Association Convention will be held at the Morrison Hotel, Chicago, on March 28, 29, and 30.

The various arrangement committees are strenuously at work to make the convention a success. Dr. Sophie A. Theilgaard, principal of the Flower Technical High School, is chairman of the hospitality committee which is planning all of the entertainment features of the convention.

Clarence Lineberger, district superintendent, is the chairman of the committee arranging for tours to Chicago industries, institutions, and schools.

The Ship will, of course, be represented by a large number of exhibitors.

Special broadcasts will inform the general public of present trends in industrial arts and vocational education. Among those taking part in these broadcasts are Earl Bedell, director of vocational education, Detroit, Mich., Dr. F. T. Struck, Head of Dept. of Industrial Education, Pennsylvania State College, State College, Pa., Dr. William H. Johnson, superintendent of schools, Chicago, Ill., and Dr. Edwin A. Lee, professor of education, Teachers College, Columbia University, New York, N. Y.

There will also be a national Epsilon Pi Tau Fraternity meeting. This will be held in the evening.

The annual Illinois Vocational Association dinner dance and banquet at which Ship awards will be distributed, will be held March 29, 1940.

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